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Abdalmuttaleb M. A. Musleh Al-Sartawi
Abdulnaser Ibrahim Nour
Islam Abdeljawad *Editors*

Business Resilience and Business Innovation for Sustainability

The Double-Edged Role of Artificial Intelligence and Other Disruptive Technologies

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Preface

Scholars, practitioners, and professionals consider business innovation as a necessity to minimize business risk. Through technological innovation, businesses can adapt to societal changes and reduce the impact of both internal and external threats and risks. Business resilience is the ability to deal with challenging conditions by ensuring the existence and prosperity of the organization. In today's rapidly evolving global landscape, businesses face unprecedented challenges and opportunities. The twin imperatives of building resilience against disruptions and driving innovation for sustainable growth have become paramount for long-term success. This book delves into the complex and often paradoxical role of artificial intelligence (AI) and other disruptive technologies in navigating this intricate terrain.

While AI and related technologies offer transformative potential for enhancing business resilience—from predictive analytics for risk mitigation to automated systems for operational continuity—they also present significant challenges. Ethical considerations, potential biases in algorithms, job displacement concerns, and the environmental impact of technology development all demand careful consideration. This double-edged sword requires a nuanced understanding to harness the benefits while mitigating the risks.

This book aims to provide a comprehensive exploration of this dynamic interplay between technology, resilience, and sustainability. It is targeted towards a diverse audience, including academics, students, researchers, business practitioners, policymakers, and anyone interested in the intersection of technology, business strategy, and sustainable development.

We explore a range of critical topics, including but not limited to technological innovation and inclusivity, sustainable educational planning and integrating technology into educational development strategies, the impact of data analytics on business intelligence, financial technology and inventory management efficiency, augmented reality and digital marketing, and many more.

This work is intended to inspire critical thinking, foster collaboration, and contribute to a more informed and responsible approach to harnessing the power of technology for the benefit of both businesses and society.

Our hope is that this book will serve as a valuable resource for navigating the complex challenges and opportunities presented by AI and other disruptive technologies in the pursuit of sustainable business excellence.

Nablus, Palestine, State of

Dr. Abdulnaser Ibrahim Nour
Dr. Islam Abdeljawad

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Accounting Harmonization Dynamics in the Arab Middle Eastern Countries: A Comparative Analysis

Muiz Abu Alia, Aladdin Dwekat, Mohammad Yaaqbeh, Bashar Fattouh, and Dana Hodali

Abstract This study investigates accounting harmonization within and between seven Arab Middle Eastern countries, using 2018 data from 255 industrial companies. By utilizing C-index and I-index metrics, the research aims to assess the harmonization extent and nature of seven key accounting measures in a diverse economic region. The findings reveal a variety of harmonization levels. High harmonization is evident in inventory valuation, PPE valuation, straight-line depreciation, and foreign currency translation, suggesting alignment with standardized accounting practices. Conversely, borrowing costs, investment property valuation, and inventory costing methods exhibit lower harmonization, attributed to the flexibility within accounting standards and regional economic conditions. A significant aspect of the study is comparing international financial reporting standards (IFRS) adopters with local standards users. While IFRS generally promotes higher harmonization, it does not uniformly guarantee this across all accounting areas. This highlights the influence of local economic and industry-specific factors on accounting practices, along with global standards. Conclusively, the study underscores the need for aligning local accounting practices with global standards like IFRS to enhance comparability and transparency in financial reporting. It contributes to the discourse on global accounting harmonization, suggesting a nuanced approach to standardization that considers local specificities. The findings are vital for policymakers, standard-setters, and financial analysts, offering insights for achieving more uniform accounting practices worldwide.

Keywords Accounting harmonization · Middle Eastern Countries · IFRS · Comparative accounting practices

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1 Introduction

Following globalization, accompanied by technological innovation, capital markets around the world have become more integrated. Operating, financing and investing activities of firms are no longer limited to their countries, and multinationality of companies has figured as an important attribute of the today business. Furthermore, the global economy has changed as the volume of international trade and foreign direct investment has been enhanced [1].

The international accounting community had to has a relevant appropriate response to enhance the usefulness of the financial statements for the information users on the international level. Usefulness of accounting information is dependent on the availability of specific qualitative characteristics including comparability [2, 3]. The International Accounting Standards Board (IASB) has sought to improve comparability of the financial statements prepared using the IFRS [1]. Comparability enables users to identify the trends of the firm performance and financial position of an entity, and to compare between different entities [4].

Nowadays the majority of the countries, including Arab countries, permits or requires the use of IFRS, with the purpose of benefiting from the accompanied advantages [4, 5]. However, while IFRS adoption is formally (de jure harmonization) increasing, the practical (de facto) harmonization is still moot given the cultural, legal, political, economic and regulatory differences exist between countries [1, 6]. Other studies questioned the appropriateness of the IFRS for non-developed countries implying the difficulty of achieving the promised advantages [7]. Due to the environmental differences, companies find themselves define, recognize and measure items of the financial statements differently. Even when the same standards are used, financial reporting practices are different following the way they are interpreted and applied by companies [8, 9].

Therefore, availability of comparable financial statements between companies is questionable, either within the same country or among different countries [10]. This study addresses this issue as it investigates the comparability of financial statements prepared by 255 companies listed on seven stock exchanges in the Arab Middle Eastern countries. Data was manually obtained from the financial statements of these companies available on the websites of exchanges of Jordan, Egypt, Saudi Arabia, Oman, Kuwait, Qatar and Palestine. Comparability is estimated based on the alternatives of seven measurement methods used by these companies. In detail, the degree of harmonization is measured in each country (within-country comparability), and between the countries (between-country comparability). Moreover, the study examines whether the financial statements of the companies that use IFRS are more harmonized compared with those that adopt other financial reporting frameworks. In the light of the aforementioned measures, this research adopts C and I indices developed by Van der Tas [11] to estimate the harmonization degree between companies in the same country, between countries and between different accounting standers adopters [12].

The study provides evidence on the comparability of IFRS-based financial statements from a region that has long been neglected in the harmonization literature. While accounting harmonization has been addressed in other regions, especially developed countries, this study estimates the harmonization degree of accounting measures between selected Arab countries and within each of them. In general, the Arab countries has similar features such as the common culture, however several differences, such as economic development and political stability, between them exist [13, 14].

Beside understanding the extent of accounting harmonization in, and between, these countries, the study uncovers the practices already used and the practices that regulators need to re-evaluate to maintain comparable financial statements. Consequently, the confidence of accounting information users in the financial statements will be attained.

2 Background, Literature Review and Research Questions

Comparability is attained when accounting rules are implemented consistently by firms from one period to another and between firms [4]. However, accounting practices may show differences between countries and even between firms of the same country because of the prevailing circumstances and the differences in interpretation and application of the accounting standards [15–17].

Accounting harmonization, the process by which accounting diversity is reduced, serves the globalization of financial markets as it facilitates comparisons between financial and economic information and improves communication [18]. Cross-border activities of firms highlighted the demand for accounting harmonization in terms of rules and practices [19]. Comparability on international level has become more important following the notable increase in the volume of international trade, the spread of multinational companies, the growth of foreign direct investment, as well as the internationalization of the financial markets [1].

IFRSs enhance the comparability and the quality of financial information on the international level [4, 20]. The issuance of IFRS has been considered as the most notable event of international harmonization, however their uniformed application was and remains a concern [4]. A lack of uniform IFRS application beside the different measurement alternatives permitted by these standards explain this concern. Accordingly, the wide international adoption of IFRS may not lead to comparable financial information [19]. The literature [16, 21, 22] attributed this to the differences in terms of economic, political, legal, financing styles, cultural, taxational, global, firm-specific factors [6, 10].

Several previous studies have addressed the harmonization extent between companies whether in the same country or from different countries [23, 24]. Early studies in the EU countries found a slight influence of IFRS on accounting harmonization between EU companies [25, 26]. However, other studies noticed an increase

in harmonization in several areas of the world [27–32]. On the other hand, a third category of studies reported mixed results [33].

Following the adoption of IFRS, [34] noticed an increased in accounting harmonization between Italian and Spanish companies. Similarly, [35] observed more accounting harmonization as a result of IFRS adoption. Consistently, [36] reported that the degree of measurement harmonization of Asian companies has significantly enhanced in the era of IFRS. Also, [24] found an increase in the comparability of the financial statements of the companies that adopt IFRS 15 compared with those that do not. However, mixed results on the comparability of the financial reporting between adopters and non-adopters of IAS 16 were reported by [17]. Likewise, [9] found a variance in accounting harmonization levels among European countries. After the IFRS adoption by countries of South East Asia, [12] revealed that I and C indices show high comparability in some areas such as foreign currency translation. A lower level of harmonization was observed in other areas like inventory valuation, depreciation of property.

Considering the above discussion, the following Research Questions (RQs) were developed:

RQ1: To what extent do accounting measurements vary among industrial listed companies in the Arab Middle Eastern countries?

RQ2: How do accounting measurements differ within individual Arab Middle Eastern countries?

RQ3: How does the level of accounting harmonization compare between IFRS adopters and local standard adopters in the Arab Middle Eastern countries?

3 Research Methodology

3.1 Sample

The Arab countries are economically developing or emerging countries. On the other hand, they have common similarities especially in terms of culture. In most of them, firms are required to use IFRS as a basis for preparing financial statements. This study focuses on the Arab Middle Eastern countries that have stock exchanges including Jordan, Egypt, Saudi Arabia, Oman, Kuwait, Qatar and Palestine. The rest of the countries were neglected due to the lack of stock exchanges, the limitation of obtaining required data, and the limited number of the listed industrial companies.

The study covers all industrial companies listed on the seven stock exchanges in 2018, conditional to the availability of their data. Other sectors were excluded given their specific reporting practices and regulatory requirements. Accordingly, the distortion caused by industry differences would be reduced. The total number of the included companies is 255 company (34 from Oman, 20 from Kuwait, 56 from Saudi Arabia, 81 from Egypt, 13 from Palestine, 42 from Jordan and 9 from Qatar). While Egypt doesn't permit the use of IFRSs, Saudi Arabia requires them only for

banks and insurance companies. In Palestine, Jordan, Bahrain, Oman, and Kuwait, IFRSs are required for all domestic listed companies [5].

3.2 Data and Measures

Data related to 7 accounting measures was obtained from the financial statements of the sample companies available at the Web sites of the exchanges. The accounting measurements considered by the study are: (i) inventory valuation; (ii) inventory costing method; (iii) borrowing costs; (iv) PPE; (v) depreciation; (vi) foreign currency translation rate; and (vii) investment property.

Following the previous studies [17], Indices developed by [11] are used to measure harmonization. H (Herfindahl) index is used to estimate harmonization between companies of the one country in the same period. It reflects the probability of using similar accounting methods by two randomly selected companies. However, H index can be applied only when companies use one alternative accounting method [37]. In detail, the H index equals the square of relative frequencies of each alternative accounting measure of a specific transaction; it is calculated as follows [38]:

$$\mathrm{H} = \sum_{i=1}^{n} \cdot \mathrm{P}_i^2$$

where: n is the number of alternative accounting methods and *Pi* is the frequency of method *i*.

C index is used if several alternatives are available for measuring a particular item. It measures harmonization level between firms on a national level depending on the number of pairs of firms that follow the same measurement. C index ranges from 0 to 1, representing the number of compatible pairs of firms compared with the total number of pairs. It increases as the same method is used by more firms. According to this index, financial statements of two firms are compatible (harmonized) if both of them apply the same accounting measure. C index is calculated as follows [38]:

$$\mathbf{C} = \mathbf{\Sigma}(\mathbf{n}_i \mathbf{x}(\mathbf{n}_i - \mathbf{1}))/(\mathbf{N}\mathbf{x}(\mathbf{N} - \mathbf{1}))$$

where: *N* is the number of the alternative methods, *n* is the number of sampled financial reporting and at the number of entities applying the *t* accounting method.

The I-index measures differences between countries in accounting practices. It doesn't indicate the statistical significance of accounting harmonization, rather it is a scale to estimate the harmonization level for comparative purposes [33, 39]. The formula of I-index is as follows:

$$\mathbf{I} = \left[\sum_{\mathbf{m}=\mathbf{1}} \mathbf{M} \cdot \left(\prod_{\mathbf{n}=\mathbf{1}}^{\mathbf{N}} \cdot \mathbf{P}_{\mathbf{mn}} \right) \right]^{(\mathbf{1}/(\mathbf{N}-\mathbf{1}))}$$

where: *m* is the alternative accounting method, *n* number of firms, *Pmn* relative frequency of the utilization of method *m* in country *n*.

I index values range from 0 to 1. It reflects the percentage of the pairs of measured firms that are comparable. The possible sensitivity increases if the number of observed countries increases. To control this sensitivity, [40] proposed the adjusted I index. When all firms in a particular country choose one of the available alternatives, the proportions are recorded as 0.99 for the unanimous method instead of 1, and 0.01 for the non-practiced method instead of 0. This method is used given its simplicity [41].

Based on [11], harmonization is classified into three categories, high, medium and low. High harmonization is observed if the index is 80% or more. From 60% to less than 80% it is medium, while a percentage less than 60% indicates that the harmonization is low [36].

Annual reports of the sampled firms were scanned to identify the methods used to measure each of the considered items. Then, the number of firms using each alternative for every country is counted for computing C index and I index [27, 34, 36]. Furthermore, notes of the financial statements were scanned to determine if the used methods are fully disclosed in an understandable manner. Following [42], seven measurement methods of selected items including PPE, inventories, foreign currency translation, and borrowing costs are included, given their significant effect on income and assets valuation. Further, these items are widely implemented by industrial firms and sufficient related disclosure is available. Considered measures, shown in Table 1, are included based on the financial reporting frameworks adopted in the countries covered by the study.

4 Results

The results of the current research are categorized into: (i) harmonization on national level; (ii) harmonization across countries, and (iii) harmonization between IFRS adopters compared with local standards adopters.

(i) ***Harmonization on national level***

As mentioned earlier, C-index is used to measure accounting harmonization between companies of the same country. Results of C Index are presented in Table 2.

Inventory Valuation and Costing Method: There is a noticeable variance in the harmonization of inventory valuation and costing methods. While Oman, Kuwait, and Qatar show full harmonization in inventory valuation, indicating a consistent approach across firms, inventory costing methods generally exhibit lower harmonization levels. This suggests diverse costing practices within the same country, potentially due to differing industrial requirements or interpretations of accounting standards [15].

Table 1 Detailed accounting measurement methods

No.	Accounting measurement	Measurement methods	References
1	Inventory valuation	Lower of cost or net realizable value (NRV); pure cost; lower of cost or NRV, with variations for raw materials; other methods; not disclosed; and not applicable	[12]
2	Inventory costing method	FIFO (first-in, first-out); weighted average (W/A); mixed; not disclosed; and not applicable	[12]
3	Borrowing costs	Capitalized; expensed; not disclosed; and not applicable	[43]
4	PPE	Cost method; revaluation model (fair value); not disclosed; and not applicable	[17]
5	Depreciation	Straight-line; declining balance; units of production; mixed methods; not disclosed; and not applicable	[12, 17]
6	Foreign currency translation rate	Current exchange rate; average rate; other rates; not disclosed; and not applicable	[12]
7	Investment property	Cost model; revaluation model; not disclosed; and not applicable	[44]

Table 2 C-index values across accounting measures and countries

Accounting measure	Jordan	Egypt	Saudi Arabia	Oman	Kuwait	Qatar	Palestine
Inventory valuation	0.66	0.73	0.86	1.00	1.00	1.00	0.58
Inventory costing method	0.34	0.41	0.57	0.62	0.44	0.58	0.24
Borrowing costs	0.54	0.58	0.71	0.55	0.66	1.00	0.47
PPE	1.00	0.95	1.00	1.00	1.00	1.00	1.00
Depreciation	1.00	0.93	0.93	0.94	1.00	1.00	0.85
Foreign currency Translation	0.95	0.84	0.93	1.00	1.00	1.00	1.00
Investment property	0.71	1.00	0.52	0.47	0.56	0.40	0.40

Note Table 2 consolidates the C-index values for each accounting measure in each country, offering a comprehensive overview of harmonization levels

Borrowing Costs: The harmonization in borrowing costs also varies, with Qatar showing full harmonization. This could imply a uniform understanding and application of the relevant standards for capitalizing or expensing borrowing costs among Qatari firms. In contrast, countries like Jordan and Palestine show lower levels of harmonization, possibly reflecting varied business practices or economic conditions influencing accounting decisions.

Property, Plant, and Equipment: A high degree of harmonization is observed across all countries in the measurement of PPE. This uniformity is attributed to the companies' reluctance to use the revaluation model in measuring PPE items. From the 255 Arab industrial companies, only 2 Egyptian companies use the fair value, implying immature practice of fair value measurement. Such results are consistent with [45].

Depreciation: The harmonization of depreciation methods is notably high in all countries, suggesting a common approach to asset depreciation. This could be due to the straightforward nature of the straight-line method, commonly preferred for its simplicity and consistency over time.

Foreign Currency Translation and Investment Property: While there is significant harmonization in foreign currency translation rates, investment property valuation shows varied levels of harmonization. This difference may arise from the choice between cost and fair value models, with the latter depending more on market conditions and management judgment [45].

In summary, the analysis indicates that while some accounting measures exhibit high levels of harmonization within countries, implying standardized practices, others show considerable variation. These results are consistent with previous studies [12, 17, 33]. This disparity can be attributed to the complexity of certain accounting areas, differences in industry practices, and the flexibility allowed by accounting standards. Understanding these variations is crucial for stakeholders relying on financial statements for decision-making, as it impacts the comparability and reliability of financial information across borders. Local standard-setters are required to reduce alternatives. Accordingly, Arab countries becomes more attractive for local and foreign investments.

(ii) ***Harmonization Across Countries***

Table 3 (A) shows mixed results related to the harmonization between Arab countries confirming the results of many studies [9, 17, 32], completely or partially. While harmonization is low for inventory costing, borrowing costs and investment property, it is high for inventory valuation, PPE, depreciation, and foreign currency translation. Differences in the financial reporting frameworks may explain such differences [1]. In general differences in the contexts of countries lead to different accounting practice [9]. These results highlight the need for improving comparability of financial statements related to some accounting practices between Arab countries.

Table 3 I index across countries, IFRS-adopters and non-IFRS-adopters

Accounting measure	A: Harmonization between countries (I-Index)	B: Harmonization between IFRS adopters and local standards adopters	
		IFRS adopters (I-Index)	Local standards adopters (I-Index)
Inventory valuation	0.80	0.82	0.78
Inventory costing method	0.44	0.42	0.47
Borrowing costs	0.56	0.50	0.56
PPE	0.98	1.00	0.97
Depreciation method	0.95	0.97	0.93
Foreign currency translation rate	0.92	0.98	0.87
Investment property	0.55	0.52	0.60

(iii) ***Harmonization Between IFRS Adopters Compared with Non-IFRS Adopters***

The comparative analysis of harmonization between IFRS and local standards adopters reveals significant insights. Table 3 (B) illustrates the nuanced landscape of accounting harmonization, where IFRS adopters generally exhibit higher levels of harmonization in key accounting practices compared to local standards adopters. In terms of inventory valuation, PPE, and depreciation method, IFRS adopters show notably higher harmonization, approaching near-uniform application in some areas. This aligns with previous findings [17, 32] that suggest IFRS's effectiveness in converging accounting practices. However, for inventory costing methods and investment property, harmonization levels are relatively lower for IFRS adopters, indicating a variance in application and interpretation.

This variability might be attributed to the flexibility within IFRS and the influence of local business environments [1], highlighting the complexity of achieving uniformity even under a global standard.

The observed differences in harmonization levels challenge the prevailing notion that IFRS adoption is a one-size-fits-all solution for global accounting challenges. They suggest that the effectiveness of international standards like IFRS might be contingent on various factors, including the nature of the accounting area and the specific regional context [15, 31, 33]. Therefore, while IFRS plays a crucial role in harmonizing accounting practices, the journey towards global harmonization in accounting remains a nuanced and multifaceted endeavour. Local circumstances of different countries must be adequately considered by the IASB when developing IFRS [16]. Furthermore, Arab countries should enhance the preparers' and regulators' IFRS-knowledge, hence raising the sound application of these standards. This will significantly contribute to improving comparability.

5 Summary of Results, Conclusion and Recommendation

This study provides evidence on the accounting harmonization from the Arab World that has long been neglected in the harmonization literature. In this comprehensive exploration of accounting harmonization, the study delved into several essential areas of inquiry (RQ1, RQ2, RQ3), focusing on the extent and nature of harmonization within and between selected Arab Middle Eastern countries and the influence of international versus local accounting standards.

Addressing the first research question (***RQ1***), the study identified varying levels of harmonization within individual countries. Notable distinctions were observed in practices such as inventory valuation and PPE valuation, where countries like Kuwait, Oman, Saudi Arabia, and Qatar demonstrated high harmonization. This suggests a strong adherence to certain harmonized accounting practices within these countries. Conversely, areas like inventory costing methods and investment property valuation showed lower levels of harmonization, reflecting diverse approaches likely influenced by local economic conditions and specific industry practices.

Turning to the second research question (***RQ2***), the analysis revealed significant differences in accounting practices. While some areas exhibited high levels of harmonization across countries, particularly in the realms of inventory valuation and fixed asset-related measures, disparities were pronounced in inventory costing methods, borrowing costs, and investment property valuation. These findings highlight the challenges posed by varying economic contexts and regulatory environments in achieving global accounting harmonization.

The third research question (***RQ3***) explored harmonization between the IFRS adopter versus non-IFRS adopters. Mixed results were obtained. In some accounting areas, IFRS adopters experience higher harmonization, yet this was not a universal trend across all accounting measures. This outcome suggests that while IFRS play a crucial role in shaping accounting practices, they are not the sole factor influencing harmonization. Local economic conditions and industry-specific requirements also have a significant bearing on accounting practices.

In conclusion, this study illuminates the intricate landscape of accounting harmonization in the Arab Middle East. It underscores the need for a nuanced approach to global accounting standards, one that acknowledges and accommodates the diversity of economic and regulatory environments.

Based on these insights, several recommendations emerge, each grounded in the nuanced understanding of the study's findings:

(1) **Streamlining Accounting Measurement Options**: The diverse levels of harmonization observed, particularly in areas like inventory costing and investment property valuation, suggest a need for more streamlined and uniform accounting practices. By reducing the range of permissible methods, especially in areas with low harmonization, financial reporting can achieve greater comparability and reliability. This recommendation is particularly relevant in the context of global investment and financial analysis, where inconsistency

in accounting practices can lead to misunderstandings or misinterpretations of financial health and performance.

(2) **Aligning Local Standards with IFRS**: The mixed impact of IFRS adoption on harmonization levels underscores the delicate balance between global standardization and local relevance. For countries like Egypt and Saudi Arabia, which primarily use local standards, aligning more closely with IFRS could bridge gaps in harmonization, especially in the context of international trade and investment. This alignment should be approached with sensitivity to local economic conditions and regulatory needs, ensuring that the adoption of IFRS complements rather than overrides regional specificities.

(3) **Acknowledging Diversity in Financial Analysis**: The variability in accounting practices across different regions necessitates a more informed and adaptable approach to financial analysis. Analysts and investors should be equipped to recognize and adjust for these variations, ensuring that their evaluations and decisions are based on an accurate understanding of different accounting practices. This recommendation is vital for fostering informed investment decisions and accurate market assessments in a globalized economic landscape.

(4) **Expanding the Scope of Research**: Given the dynamic nature of global accounting practices, there is a clear need for ongoing research in this field. Future studies should expand to include a broader range of countries and regions, particularly those not extensively covered in existing literature. This expansion would provide a more comprehensive understanding of global harmonization challenges and opportunities, informing future policy and standard-setting initiatives. Such research is crucial not only for academic enrichment but also for providing practical insights to policymakers and standard-setters as they navigate the complexities of global accounting harmonization. It is also recommended to estimate the relationship between accounting comparability and the promised advantages of engaging in international accounting harmonization trend, such as attracting foreign investment.

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AI at the Heart of Development: Revolutionizing Accounting Processes for Comprehensive Progress



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Abstract Artificial intelligence (AI) has significantly transformed accounting processes, ushering in a new era of efficiency, accuracy, and strategic insights. This paper explores the profound impact of AI on accounting practices, highlighting its role in fostering comprehensive progress towards development goals. By automating tasks, improving financial analysis, providing real-time insights, enhancing transparency and accountability, and promoting sustainability, AI revolutionizes accounting practices. However, it is crucial to address the challenges and ethical considerations associated with AI adoption. Through strategic investment, collaboration, and continuous learning, organizations can leverage AI to drive sustainable development in the digital age.

Keywords Artificial intelligent · Accounting · Financial analysis · Decision-making

1 Introduction

Artificial Intelligence (AI) is a key innovation in today's world, transforming traditional approaches and propelling advancement in a variety of industries. In the field of accounting, the integration of AI into complex accounting procedures represents a significant turn in the direction of increased effectiveness, accuracy, and perceptive analysis. This study examines how AI has impacted accounting procedures and highlights how important it is to achieving goals for holistic development.

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Organizations are using artificial intelligence (AI) more and more to automate repetitive processes, streamline operations, and extract valuable insights from vast amounts of financial data. AI-driven algorithms are revolutionizing the way accountants work, from tedious data input to complex financial analysis. They free up accountants from repetitive chores and enable them to concentrate on higher-value work like identifying financial patterns and formulating strategic suggestions [1].

Moreover, AI-driven accounting solutions provide instantaneous financial performance information, empowering businesses to act quickly and intelligently. These systems forecast future trends, assess possible dangers, and optimize resource allocation by carefully examining past data and finding patterns. This allows for more intelligent decision-making and resource management [2].

Apart from augmenting operational efficacy, artificial intelligence assumes a crucial function in propagating transparency, accountability, and sustainability in accounting procedures. For example, AI-driven audit solutions provide more thorough and effective audits by precisely identifying anomalies and discrepancies. This promotes confidence and trust among stakeholders in addition to acting as a deterrent against fraudulent activity [3].

Furthermore, AI-enabled accounting procedures support sustainability initiatives by maximizing the use of available resources, reducing waste, and pinpointing opportunities for increased productivity [4]. Organizations match their accounting practices with larger developmental goals and societal imperatives by minimizing their environmental impact while optimizing their contributions to society and the economy.

However, the revolutionary possibilities of artificial intelligence in accounting, it is crucial to tackle the corresponding obstacles and moral dilemmas. The digital era requires enterprises to embrace innovation and exploit the full potential of artificial intelligence (AI) while also guiding sustainable development through strategic investment, collaboration, and continuous learning.

The methodology for this research relied on a demanding review of previous studies and literature to provide a comprehensive understanding of the challenges and ethical considerations surrounding the relationship between AI and accounting. By building upon the insights gleaned from previous research, this study aimed to contribute to the scholarly discourse and advance knowledge in this emerging area of study.

2 Background

Artificial Intelligence (AI) has revolutionized numerous industries, and accounting is no exception. The history of AI in accounting traces back to the mid-twentieth century when researchers began exploring the potential of computational systems to automate tasks traditionally performed by accountants. The roots of AI in accounting can be seen in the development of expert systems, which aimed to replicate human expertise in specific domains [5].

In the 1970s and 1980s [6], expert systems emerged as one of the earliest forms of AI applied in accounting. These systems utilized knowledge bases and rule-based reasoning to analyze financial data, interpret regulations, and provide recommendations. While rudimentary compared to contemporary AI technologies, expert systems laid the foundation for further advancements in the field.

The late twentieth century [5] witnessed the emergence of more sophisticated AI techniques such as neural networks and machine learning. These approaches enabled accountants to leverage vast amounts of data for pattern recognition, predictive modeling, and decision-making. Machine learning algorithms, in particular, proved instrumental in automating repetitive accounting tasks, such as data entry, classification, and reconciliation.

The twenty-first century marked a significant acceleration in AI adoption within the accounting profession [7]. Advanced analytics, natural language processing (NLP), and robotic process automation (RPA) became integral components of modern accounting software suites. These technologies empower accountants to extract insights from unstructured data, automate complex workflows, and enhance audit procedures [8].

One notable area where AI has made substantial inroads in accounting is fraud detection and risk management [9]. AI-powered algorithms can analyze transactional data in real-time, identify anomalies, and flag potentially fraudulent activities [10]. Moreover, AI enables accountants to conduct more thorough risk assessments and compliance audits by analyzing vast datasets with unparalleled speed and accuracy.

Furthermore, AI-driven predictive analytics have transformed financial forecasting and budgeting processes. By analyzing historical data and market trends, AI algorithms can generate more accurate forecasts, helping businesses make informed decisions and mitigate financial risks [11].

3 AI in Accounting

The infusion of Artificial Intelligence (AI) into accounting marks a significant shift in financial management, promising to modernize practices and propel progress towards development goals. This review address existing research on AI's impact on accounting processes and its implications for achieving comprehensive progress.

The integration of Artificial Intelligence (AI) into accounting practices marks a significant evolution in the field, fostering a symbiotic relationship between technology and financial management [1]. AI offers an excess of tools and techniques that enhance the efficiency, accuracy, and strategic decision-making capabilities of accountants. One key aspect of this relationship is the automation of routine tasks. AI-driven algorithms can process large volumes of data at high speeds, automating tasks such as data entry, reconciliation, and transaction processing. This automation not only reduces the time and effort required for these tasks but also minimizes the potential for human error [12].

Moreover, AI enables advanced data analysis and predictive modelling, providing accountants with deeper insights into financial trends, risk assessment, and forecasting [13]. By leveraging machine learning algorithms, accountants can identify patterns and anomalies in financial data, enabling more informed decision-making and strategic planning. Additionally, AI-powered natural language processing technologies facilitate the extraction and interpretation of insights from unstructured data sources like emails, invoices, and contracts, streamlining audit procedures and enhancing compliance measures [14].

The relationship between AI and accounting also extends to the realm of regulatory compliance and risk management [15]. AI technologies can monitor transactions in real-time, flagging suspicious activities and helping organizations comply with regulatory requirements. Furthermore, AI-driven predictive analytics can assess financial risks and identify potential frauds, enabling proactive risk mitigation strategies.

4 Enhanced Financial Analysis

Artificial Intelligence (AI) has revolutionized financial analysis by leveraging advanced algorithms and data processing capabilities to enhance efficiency and accuracy [9]. AI enables the analysis of vast amounts of financial data at unprecedented speeds, providing real-time insights into market trends, investment opportunities, and risk assessment. Through machine learning algorithms, AI can identify complex patterns and correlations within financial data, allowing for more accurate predictions and informed decision-making.

Furthermore, AI-powered predictive analytics tools can forecast future financial trends and outcomes based on historical data and current market conditions. These forecasts enable financial analysts to anticipate market movements and make proactive investment decisions, thereby maximizing returns and minimizing risks [16].

Additionally, AI enhances financial analysis through natural language processing (NLP) technologies [17], which can interpret and analyze textual data from financial reports, news articles, and social media. By extracting valuable insights and sentiments from textual data, AI-powered NLP tools enable analysts to gauge market sentiment, identify emerging trends, and assess the impact of news events on financial markets.

5 Real-Time Decision-Making

Artificial Intelligence (AI) plays a crucial role in facilitating real-time decision-making across various domains [18, 25, 26]. By harnessing advanced algorithms and data processing capabilities, AI enables organizations to analyze vast streams of data instantaneously, extracting actionable insights to inform timely decisions.

One key aspect of AI-driven real-time decision-making is its ability to process data at unprecedented speeds [19, 27]. AI algorithms can rapidly sift through massive datasets, identifying patterns, trends, and anomalies in real-time. This capability empowers decision-makers to respond swiftly to changing circumstances, whether in financial markets, supply chain management, or customer service [28].

Furthermore, AI-powered predictive analytics tools enhance real-time decision-making by forecasting future trends and outcomes based on current data inputs. These forecasts enable organizations to anticipate potential risks and opportunities, proactively adjusting strategies to capitalize on market dynamics [10, 29].

Moreover, AI facilitates real-time decision-making through automated decision-making systems. These systems leverage AI algorithms to analyze incoming data streams and execute predefined actions or decisions without human intervention. This not only reduces response times but also enhances consistency and efficiency in decision-making processes [20, 30].

6 Challenges and Ethics

The integration of Artificial Intelligence (AI) into accounting practices introduces a multitude of challenges and ethical considerations that necessitate careful navigation. One significant challenge is the potential disruption to traditional accounting roles [21]. As AI technologies automate routine tasks such as data entry, reconciliation, and transaction processing, there is a legitimate concern about the displacement of human workers. While AI can enhance efficiency and accuracy, it also raises questions about the future role of accountants and the need for ongoing workforce training and upskilling to adapt to the evolving landscape [22].

Moreover, the accuracy and reliability of AI-driven accounting systems pose ethical dilemmas [23, 24]. While AI algorithms can analyze vast amounts of financial data with speed and precision, there is always a risk of algorithmic bias or errors in the data inputs. This raises concerns about the integrity and transparency of AI-powered accounting processes, particularly in critical areas such as financial reporting and auditing. Ensuring the accountability and trustworthiness of AI systems requires robust validation processes and continuous monitoring to detect and address any discrepancies or biases.

Additionally, data privacy and security are paramount ethical considerations in the relationship between AI and accounting. AI algorithms rely on access to large volumes of data, including sensitive financial information, which must be safeguarded against unauthorized access, manipulation, or misuse [22]. The ethical use of AI in accounting requires adherence to stringent data protection regulations and the implementation of robust security measures to protect sensitive information.

Furthermore, there are broader ethical implications surrounding the responsible use of AI in accounting. This includes considerations such as the ethical implications of AI-driven decision-making, the potential for AI to perpetuate or exacerbate

existing inequalities, and the ethical responsibilities of organizations and individuals in the development and deployment of AI technologies [21].

7 Conclusion

The comprehensive review of previous studies and literature regarding the integration of Artificial Intelligence (AI) in accounting practices has provided valuable insights into the challenges and ethical considerations inherent in this evolving relationship. Through an in-depth analysis of existing research findings, theoretical frameworks, and empirical evidence, several key conclusions can be drawn.

Firstly, the integration of AI in accounting holds immense potential to enhance efficiency, accuracy, and decision-making processes within the profession. AI technologies offer opportunities to automate routine tasks, analyze vast amounts of financial data, and provide valuable insights for strategic planning and risk management. However, the adoption of AI also presents challenges, including concerns about job displacement, algorithmic bias, data privacy, and security.

Secondly, while AI-driven automation can streamline accounting processes and improve productivity, there is a need to address the potential impact on employment opportunities for accountants. Efforts to mitigate job displacement may include workforce training and upskilling initiatives to equip professionals with the skills needed to adapt to the changing landscape.

Furthermore, ensuring the accuracy and reliability of AI-driven accounting systems is paramount to maintaining trust and transparency in financial reporting and auditing practices. Addressing algorithmic bias and implementing robust validation processes are critical steps to uphold the integrity of AI-powered decision-making processes.

Additionally, safeguarding data privacy and security remains a significant ethical consideration in the relationship between AI and accounting. Stricter regulations and enhanced security measures are essential to protect sensitive financial information from unauthorized access or misuse.

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Artificial Intelligence in the Banking Industry: A Bibliometric and Directions Ahead



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Abstract In the past few years, fintech has become the junction between finance and technology, which are two core sectors. Financial technology and banks are expected to continue forming a stronger union in the future as new applications that are driven by artificial intelligence emerge, creating a lot of opportunities. This article examines the effect of financial technology on banking operations, highlighting the advantages of incorporating cutting-edge artificial intelligence technology. The collaboration of financial technology and artificial intelligence is not only meant to strengthen banks' stability but also to widen their competitive edge and diminish inefficiencies. These contemporary systems are anticipated to assist in improving outputs, increasing efficiency, improving risk management, and accelerating the decision-making process. This integration has been completely transformative and has, to a great extent, altered the landscape of the financial and banking industries. It has significant implications for the future of the banking industry.

Keywords Artificial intelligence (AI) · Banks · Risk management · Fintech · Credit risk

1 Introduction

The concept of creating machines capable of intelligent decision-making and reasoning dates back to the mid-twentieth century. However, it is only in recent years that commercial applications of artificial intelligence (AI) techniques have gained significant traction, offering solutions to a plethora of problems and enhancing various processes. The pervasive integration of AI across all facets of life has spurred global competition in delivering advanced AI-based solutions [1]. Consequently, companies are compelled to explore innovative technological avenues [2] and make

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substantial investments in both infrastructure and expertise to harness the competitive advantages associated with AI [3].

AI has found its way into financial applications in the recent years with many tasks being executed by it such as determining stock market trends, forecasting bankruptcy, and the analysis of customer satisfaction which have been made possible by the intelligent application of big data science, artificial neural networks, and deep learning techniques [4]. Financial institutions today enjoy the application of advanced technologies for the processing of huge datasets with accuracy and speed impossible for human beings to emulate. These technologies allow forecasting market behaviours, trading, and client service customization. They also increase the investment performance [5]. Accordingly, AI technologies are now an irreversible aspect of financial services, increasing both the quality and productivity of the industry.

This research aims to provide insights into the current landscape of AI applications in bank management, with a particular focus on risk management, while also proposing avenues for future research. The following research questions will be addressed:

1. How do AI applications impact the banking industry?
2. What role does AI play in managing risks, particularly credit risk?

By the scope of this research, AI has been shown as a force of transformation in business, banking, and society-wide changes that cannot be ignored. AI helps to perform credit analysis becoming the tool of the accurate decision making in the financial context as well as in other fields. Technologies like smart devices allow banks to develop new and innovative financial products that directly appeal to their clientele, and in turn, boost client satisfaction and attract additional customers.

In the process of analysing AI in banking, we decided to use bibliometric analysis as a tool to answer the main research questions. Following Adeyinka-Ojo's [6] classification method, we meticulously selected and examined research studies related to the central research questions. In January 2024, we searched the Web of Science database for a publication from 2019 to 2023. We formed the search phrase using "AI," "finance," and "banking" as the main keywords related to the research topic. The research gave a total of 1473 publications after two rounds of filtering: the first one was by language and document type, and the other one was based on title, abstract, and keywords. Therefore, we structured the obtained literature into five main themes to equip the reader with a comprehensive understanding of the research topics and the relationship between them. The main purpose of this segmentation was to give a better insight and understanding into the subject and give an opportunity to look at the relationships between the researched topics.

The paper is structured as follows: Sect. 1 introduced the research, Sect. 2 explores bibliometric results, Sect. 3 reviews the main five themes, Sect. 4 investigates the challenges of the use of artificial intelligence. Lastly, Sect. 5 concludes.

2 Bibliometric Analysis

Following the outlined methodology for reviewing selected articles, Table 1 presents the main dataset obtained from the Web of Science.

Figure 1 displays the annual publication count, while relevant journals are categorized in Fig. 2, showing that IEEE Access published the highest number of documents, followed by Sustainability, with Expert Systems with Applications ranking lower.

The analysis of retrieved articles reveals a steady and significant growth rate of approximately 22% per year in the number of publications during the study period. Additionally, China emerges as a prominent country in terms of publications, as illustrated in Fig. 3.

Figure 4 highlights the top ten frequent keywords, with "Artificial Intelligence" being the most prevalent, followed by "Machine Learning," and "Innovation" being the least common. Figure 5 illustrates the co-occurrence of keywords, indicating multifaceted connections with artificial intelligence across various dimensions such as risk management, credit risk, chatbots, credit scoring, security, neural networks, machine learning, deep learning, data mining, and fraud detection. The analysis in

Table 1 Main information extracted from the WoS database

Description	Results	Description	Results	Description	Results
Main information about data		*Document contents*		*Document types*	
Timespan	2019:2023	Keywords Plus (ID)	2035	Article	855
Sources (Journals, Books, etc.)	953	Author's Keywords (DE)	4969	Article; book chapter	15
Documents	1473	*Authors*		Article; early access	88
Annual growth rate %	22.15	Authors	5032	Article; proceedings paper	5
Document average age	2.58	Authors of single-authored docs	130	Bibliography	1
Average citations per doc	7.231	*Authors collaboration*		Correction; early access	1
References	61,912	Single-authored docs	137	Proceedings paper	432
		Co-Authors per doc	4.07	Review	71
		International co-authorships %	30.96	Review; book chapter	1
				Review; early access	4

Table 2 Fig. 2: Challenges of Adopting Artificial Intelligence Techniques in the Financial Sector and Risk Management

FinTech	AI in financial markets	Risk management	Credit Risk
• Total reliance on technology • Complexity • Exposed to mistake • System complexity • Lack of transparency • Lack of administrative • Budget construction	• Jobs threat • Social divide • Challenges in training • Data discrepancy • Evolving and unstable • Regulatory gaps • Unfair discrimination • Lack of platforms and tools available • Lack of artificial intelligence skills among employee	• Data security • Data violation • Threat in privacy • Low prediction quality • Inexplicable decisions • Ambiguity • Difficulty identifying sources of error • Lack of trust in AI • Inaccurate reports	• Invalid decisions • Legal problems and difficulty tracking • Reliance on historical data • Unpredictability • Lack of available data • Help tool and not supported

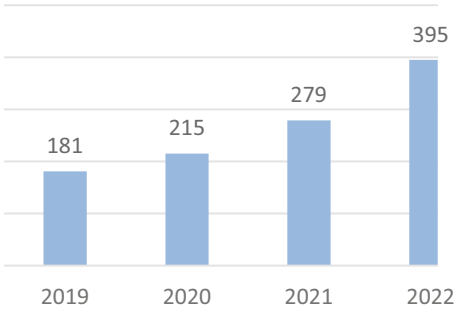


Fig. 1 Number of publications per year

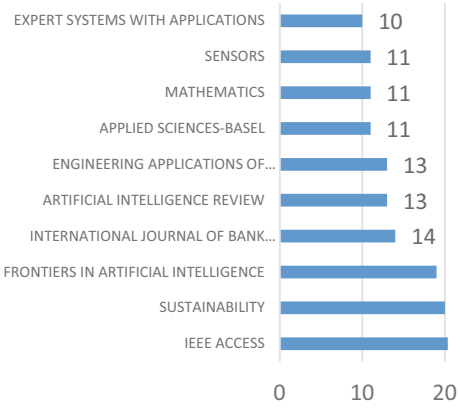


Fig. 2 Number of publications per journal

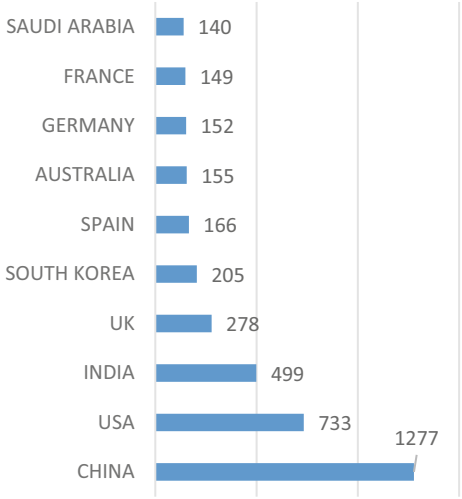


Fig. 3 Number of publications per country

the next section provides an overview of the diverse subjects covered in the literature, emphasizing the intricate relationships between AI and the banking industry.

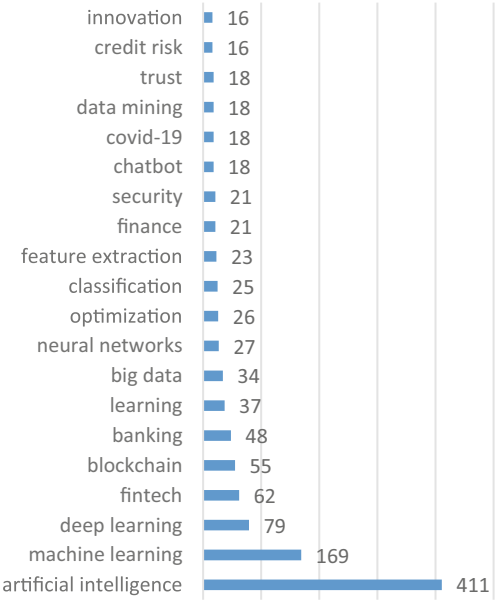


Fig. 4 Most frequent keywords

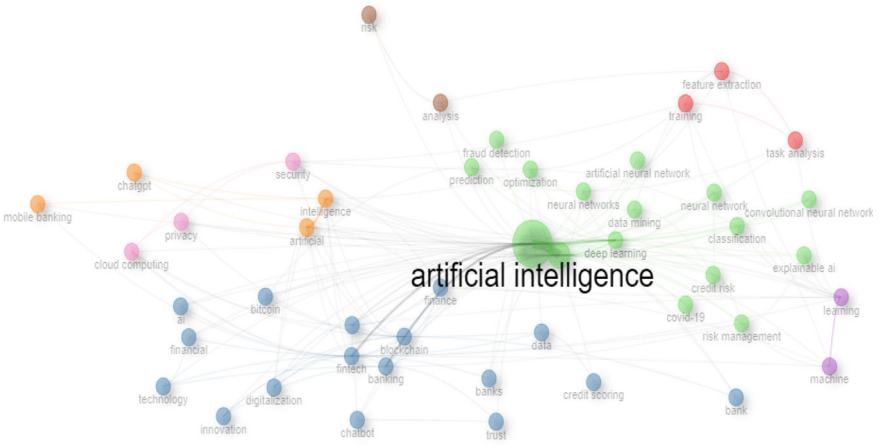


Fig. 5 Co-occurrence of keyword

3 Review of Main Themes

3.1 AI and FinTechs

AI and FinTech integration is a contemporary technology embedded into financial services that are used in data analysis [7]. The integration of AI into the FinTech industry, with the assistance of big data and advanced management tools, increases the overall productivity and usefulness of the industry, which in turn opens many avenues for innovation. FinTech startups, which at present are under-exploited and hence attract large investor attention [1], have become one of the most attractive areas for investment.

AI technologies provide a whole spectrum of powerful and efficient tools [8, 9], that can be used from the analysis of financial and banking sector to idea generation and the automation of crucial organizational processes. In return, the banks are now in search of a partnership with FinTech companies by means of strategic partnership, data sharing, and joint apps development. The partnership is an example of how technology can be embraced by the banking sector, facilitating the uptake of new technologies on the one hand, and improving the customer experience through services like financial analytics, micro services, and advanced banking digital services on the other. In addition to this, it also helps with cost reduction through its emphasis on the need to be able to process large volumes of payments, documented records, and official paperwork within banks and stock exchange companies [10].

AI models and applications have been developed at a breakneck pace due to the technological advancements and this in turn has made AI a core in the banking sector [7]. The AI has long been acknowledged as a disruptive technology with the potential to transform the companies' operations and the banking services industry,

as it departs from traditional business methods towards modern technology-driven approaches [11]. AI's relevance is not limited to forecasting financial companies' revenues, but is also critical in improving corporate operations, analysing big data, and preventing fraud [12]. The acquisition and analysis of huge volumes of data have great effect on the performance of enterprises, producing valuable insights of high quality for best decision-making [13].

While the financial technology offers many upsides it is also important to recognize and deal with challenges and disadvantages in order to ensure that financial services are provided securely and efficiently to the customers. One important issue is that it may bring the potential of job losses, which means that there would be fewer human employment [14]. Digital transformations in the financial sector cause financial institutions to switch to independent high-tech systems which are mostly automated, as such systems take over tasks such as data collection and the initial analysis. Yet, it should be noted that such automated systems are not supposed to fully replace the human workers in this industry. Whilst many researchers agree that AI robotics is a major factor for the substitution of human labor, there is a different viewpoint. In their article, the authors Kanimozhi and Jacob [15] contend that AI will actually generate new employment opportunities.

3.2 AI in Financial Institutions

Artificial intelligence (AI) is expected to become a critical tool for banking and financial services, which will use smart applications to detect patterns, spot anomalies, and streamline financial operations. Although it was anticipated that artificial intelligence would evolve faster, the process turned out to be a gradual one that required several stages of thorough development and testing.

Following the 2008–2009 financial crisis, technology companies began to enjoy the spotlight in the startup world. The wave of new startups was stimulated by a set of precautionary measures, rules, and laws, which were developed in response to the crisis, covering the issue of financial terrorism and money laundering, all of which are aimed at defending the interests of the society, namely banks, companies, and individuals [1].

Of course, the success of financial organizations depends not only on their technical achievements but also on their social intelligence. The way these organizations manage the flow of information through language, technological networks, partnerships with other entities, or any other sources, is the most important [16]. Within the realm of financial and banking sector, technical difficulties, entailed in natural language processing which is the main issue in the sense of accurately extracting and analysing complex financial statements, arise. Using AI models, which are becoming more and more sophisticated at a breath-taking pace, companies, as well as individuals must adjust to the new realities. This entails boosting machine learning performance by training data extension, hence speeding up the training time with a high-performance computing. One of the major reasons behind the recent advancements of

deep learning is the plentiful data and quick processors with more speed. High level communication with customers is of huge importance for a proper comprehension of the system, and for the purpose of maintaining it. User management of the models is necessary to avoid wrongful data and results [17]. The development of the Internet technology has greatly contributed to the progress of the society and economy, which has become so common to be used in different economic and scientific fields. It has become an inexorable source of the general public, banks, and business partners who need to grasp the fundamental information of the institution.

In the era of big data, the efficiency of data transfer, preservation, and dissemination as well as real time access to financial, commercial, and other related datasets has been significantly enhanced by big data [18]. Financial services providers that modify their software and integrate smart technology, data, analytics, and other financial products into their banking solutions are more likely to design the best strategies and distribution of their products.

AI implementation ensures a consistently data-driven approach, increasing the efficiency as well as reliability of decision-making in the banking system. Different from the specific kinds of deviances that result from human assessment, which remain greatly influenced by individual behaviour, artificial intelligence plays a crucial role in ensuring unbiased risk assessment [19].

The emergence of the Coronavirus (COVID-19) in the world has triggered the change of the global course, which has exhibited the requirement for the new strategies and innovations. The global reaction to the pandemic has accentuated the research and implementation of novel job processes, establishing new habits, and even the birth of new digital currencies [1]. This life-changing period illustrated both the strength and adaptability of different sectors, such as finance and technology, which were committed to creating new concepts that could help to tackle the problems imposed by the pandemic.

3.3 AI and Risk Management

Artificial intelligence, at the moment, is the most recent research domain of risk management [20]. A comprehensive and comprehensible knowledge of risks is an asset that helps managers to take the right decisions, which in their turn serve as the foundation for increasing organizational efficiency as well as for ensuring good performance, hence making the difference between successful and unsuccessful managers. Therefore, there is a lot of money spent by organizations developing strategies that prevent huge financial and operational risks [18].

With the situation where the details regarding the choices and transactions are vague, taking decisions that involve risk may be hard thus. AI, in this respect, acts a significant tool which prevent or minimize the probability of such losses in the mentioned circumstances. It is very much important to admit, that people like avoiding ambiguity which may lead to the suboptimal decision. Using the data on past rationality and the reaction to unpredictable situations are not the only ways to

predict the future. The new elements are expected to come in. The central characteristic of decision making is the employment of a fair and logical reasoning process, considering individual and cognitive factors that will affect different individuals and their risk-taking behavior.

AI has assumed a major role in reducing the risks in the banking sector with a number of ways. It has certainly gone a long way in raising the credit risk management competency of banks by evaluating the repaying capacity of their customers using the latest data analytics technology. Eventually, this gives rise to the positive feedback cycle on the financial sustainability and has a more effective and secure banking system. Moreover, the term traditional technology has been redefined, with the use of smart contracts being one of the most notable improvements [21].

The consequences of improper investment choices appeared during the 2008 global economic crisis [22]. To be concluded, it is necessary to say that this situation stipulates the development of the newest risk control technologies, where artificial intelligence plays a crucial role and gives the banks a better opportunity for risk assessment and management.

3.4 AI and Bank Credit

For a long time, the commercial banks have been very instrumental in the building of databases which cover lots of customers' personal details. The implementation of these databases is intended to improve the overall performance of the bank, which, in turn, boosts the formulation of strategic decisions Al-Araj et al. [23]. However, Though the central objective of banks is the continuous production of profits, the strategies to pursue this goal may differ based on the policies of the state [24]. The establishment and utilization of advanced financial databases by banks show how significant they are in shaping the financial landscape and ensuring the availability of accurate information.

Banks' credit service delivery is one of the important processes that gives individuals and companies the access to finance for their aspirations and requirements. Consumers' banking behavior is being monitored, and credit files are being established with the help of internet and social media, making it possible to get more precise assessment of their ability to pay loans back. This enables the measurement of credit risks, makes decision making to be accurate, takes alternative data like browsing records, and incorporates them to get more insights [25]. Fintech start-ups, who try to speed up and perfect the credit eligibility decision process, do this by collecting massive amounts of data and creating their own rating systems along with traditional ones [14]. The credit services supported by artificial intelligence is a noteworthy innovation. If artificial intelligence is applied the right way, credit operations will experience an increase in efficiency and accuracy, at the same time improving customer experience.

3.5 AI and SME's Credit

Small and medium-sized companies aren't normally able to get loans from specialized institutes because of the insufficiency of their credit history and financial information. For this reason, a smart evaluation system integrated with AI technologies is of great significance for assessing if the borrower is capable to pay off the debt. However, this evaluation will be extremely useful for credit service agencies which can be used as a risk mitigation tool for future credit risks. Without a good risk management in this context, companies run the risk of losing a great chunk of their finances which can possibly result in irrecoverable losses [7].

As a matter of fact, microcredit availability is directly related to the overall economy and involving different areas such as the agriculture sector and so on. In most countries, farmers have not really experienced the full benefits of banking services, and thus the issue of credit has been rather inadequately addressed. Financial inclusion's main purpose is to create an opportunity for many groups, including farmers, to access banking services [26]. Nonetheless, financial institutions mostly utilize historical data for lending decisions,scenario for which farmers seldom have the historic data. Within this notion, artificial intelligence algorithms serve as meaningful components. Banks and financial organizations may benefit from credit bureaus in terms of developing customer folders that are used to determine creditworthiness later [27]. They are totally based on analysis of huge data covering customers' behavior and finances in order to find predictive models and criteria [28].

According to Krivorotov [29]. The data of consumer behavior obtained through credit cards constitutes the basis of the advanced models today,these models are aimed at developing an extensive scoring matrix of consumers' credit quality. Machine learning techniques integrated with the availableness of vast data sets have far surpassed the effectiveness of the risk control approach of yester years. This serves as an evidence of the importance that include artificial intelligence and machine learning possess in the financial industry. Machine learning techniques play a dominant role in the development of the risk models; enabling the latter to grasp the dynamic nature of the risk factors, which in turn improves their performance and enhances their scope in identifying and mitigating risk.

In order to effectively address credit risks, financial inclusion has to be promoted, which in turn involves creating the environment for the provision of financial services to all the segments of the society including the SME business sector. This approach implies financial viability of this project and the possibility of reaching everyone who needs our services. Mixing financial technology and artificial intelligence is the principal aspect that contributes to the development of the most heterogeneous group of people. The government promotes this by offering companies with incentives and building the necessary infrastructure for this integration to be a success. For example, the Chinese government has established AI and digital finance as the driving force with the goal of having inclusive digital finance. This assistance has led to several major achievements which include the growth of financial services coverage, lending to small and medium businesses and control role on financial risks [26].

The effectiveness of the capital allocated to financial inclusion strategies in China might be gradually reduced in the future. However, this is not expected to happen immediately [30]. This emphasizes the need for ongoing evaluation and adaptation to maintain the effectiveness of financial inclusion strategies.

4 The Challenges Ahead

Despite the fact that AI technologies progress significantly, there are certain issues that can be raised nowadays. For instance, such issues arise due to uncertainty, insecurity, insufficiency of transparency in the system and lack of specifications and safety of the system users [31]. AI bias inherent in propensities for specific trends is another crucial problem for society. Additionally, other obstacles come together which are rivalry among banks, changing customers' tastes, high costs of maintaining technological infrastructure which is key for the safe and uninterrupted bank work, and inevitable need to adapt computer systems and ATMs [5].

Ethical controversies, and the historical misapplication of AI additionally complicate these issues [32]. The abuse of personal data as it has come to light in the Facebook case where the data of 50 million accounts was exploited without permission would not only draw the Facebook CEO Mark Zuckerberg to the senate of the United States but bring the share price of the company down as well [22].

The rapid increase in cybercrime and fraud cases makes the already complicated job of a company even more difficult [33], as they have to hire a team to investigate and examine such instances, which costs money. Those costs tripled in billions, highlighting the point of how vital the efficient ones are. An AI system whose purpose is charitable can effectively tackle fundamental challenges that prevent charitable organizations from functioning properly, such as donation collection mechanisms, money laundering prevention, and terrorism related issues [34]. This emphasizes the role of the constant reinforcement of ethics, regulations, and vigilance in the given of AI technologies.

Artificial intelligence technologies application in financial industries is not problem free, and there are several crucial aspects that need to be addressed. Such models should be understandable and transparent, they have to comply with established regulations, documents, and principles by specialists who write legal reports and ethical principles for acceptable AI usage. The insufficient clarity in the executing of AI systems is a serious issue which, among others, is often encountered when AI technologies are used in finance and insurance. The problem of providing explanations can often arise in complex decision-making process of the intelligent models. This makes it difficult to explain the reasons and the criteria used to make these decisions. Such a situation also damages the images of the financial sector, as it could be regarded as a system that is not fair and unexplainable. These issues need to be addressed as a priority in order to create confidence in AI technologies implemented by financial institutions. Table 1 presents main challenges associated with AI.

5 Conclusion

The study findings show unequivocally that it is AI which boosts the competitiveness of companies in general, and mainly the financial sector. These studies reveal an AI implication, where data processing becomes faster, the efficiency increases, and productivity increases as well. Hence, it will increase profits as well as it contributes to better risk management, risk reduction and risk control. The artificial intelligence utilization is considered indispensable and it is a tool that all financial companies must master in order to thrive in the market. Its contribution to the decision-making process, which is regarded as significant in promoting the company's growth and maintaining a high market value, is invaluable.

Nevertheless, it is essential to pay attention to the specific limitations in the previous research. Of particular importance is, such studies have neglected to broadly discuss the areas of what AI cannot do in the financial industry. For instance, AI is incompetent to generate and build up personal relationships with a client. It cannot engage the client in emotional interaction based on modalities of tone voice and body language. Furthermore, it could be sluggish in terms of adaptation and interaction in scenarios of hyperdynamic environment. These limitations should not be overlooked, on the contrary, they should be used for the formation of a holistic picture about the role and perspectives of AI in finance.

In spite of these shortcomings, artificial intelligence technology still provides companies with a number of advantages such as multiplying the opportunities and eliminating difficulties as well as opening broader horizons in the field of financial services. As AI technology advances in the future, there must be further investigations and development in AI technology together with a knowledge balance of its capabilities and shortcomings will be crucial to maximize its potential and innovate the financial sector.

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The Impact of Data Analytics on the Business Intelligence Technology



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Abstract The main aim of this study to determine the role of data analytics in enhance administrative rates and profitability of business. The augmented version of the DeLone and McLean framework shows promise for innovation. Nonetheless, it necessitates a detailed elaboration on its implementation within the managerial tier of Business Intelligence structures. Additionally, an illustrative depiction of the framework would enhance comprehension. The proposed research model extends the DeLone and McLean model's application from the human level to the organizational level in BI technology achievement or efficiency study at order to gather principal quantitative data from managers and IT developers at Jordanian-listed companies that rely on BI systems for different managerial levels, a cross-sectional survey is being designed, sample size 150 and the researcher use PLS to analysis the data. This paraphrase changes the structure of the original sentence and uses synonyms where appropriate, while maintaining the original meaning. It also avoids the use of personal pronouns and passive voice to keep the statement in an academic tone. A technologically advanced questioner is used toward collect crucial quantitative data from Institutions managers that focus on business intelligence structures to create functional, tactical, and strategic conclusions for the Jordanian Institutions. The main results of this research: (1)—structure excellence. (2)—Information excellence and exercise excellence are important forecasters of employer pleasure, nevertheless perceived advantage is not, according to practical data. (3)—Data value was developed to be an effective predictor of perceived advantage and employer satisfaction. (4)—The effect of the alleged value on customer satisfaction was crucial since both elements have a beneficial impact on businesses' profitability. This study has significant value related to the report is a new effort to measure the organizational level efficiency of BI

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technologies outside the setting of industrialized nations. No previous study, toward the superlative of the authors' information, has shared all the scopes considered in this study into an only model.

Keywords BI structures · Data analytics · Big data · Efficiency · Jordan country

1 Introduction

Data management and intelligent technology have made great strides in the time of numerical alteration, impacting almost every aspect of company, including finance, accounting, trade, advertising, and knowledge and controller. Businesses today depend more on intelligent technologies to assist them analyze vast data and making decisions that will help them stay competitive because of the vast measurements of commercial statistics available. The main objective of the innovative technologies included into artificial intelligence is to improve innovative methods for data gathering and analysis that assistance organizations expand their decision-making process via the use of data analytics, this will be done by utilizing different data analysis techniques that integrate business and artificial intelligence [1]. Using data analysis can improve the process of making effective strategic and operational decisions, to be more specific, business intelligence (BI) employs technologies like a sizable database, or data warehouse, online analytical processing, data mining, dashboard/screen tools, production reporting, end-client query and reporting, and modelling tools [2]. According to [3]. Due to the multiple advantages that may be gained through BI, including cost savings, a decrease in human error rates, improved client facility, increased production, competence, and efficiency, as well as a faster decision-making process, it is in high demand. In light of this, we were inspired to conduct this study for two reasons: first, several Jordanian businesses have been harmed by BI structure that is incapable to manage their commercial procedures besides deliver the anticipated firm's advantage, and second, there aren't any models or outlines aimed at assessing BI efficiency at the organization level. The purpose of this article is to fill in these knowledge gaps by presenting a model for BI efficiency dimension that is based on. It then attempts to empirically validate this model consuming data from instrument conducted in the administrative locations of registered Jordanian companies that have executed BI system to address the problem of its failure. The following is a summary of the remaining text in the article: the following in light of this, we were inspired to undertake this study for two reasons: first, many Jordanian businesses have been harmed by BI technology that cannot meet their business needs, second, this part explains the academic underpinnings of BI achievement assessment. We next go through our study plan and hypothesis. The study methods and data analysis process are then provided. Our conclusions, theoretical contributions, and application of our conclusions are then presented. Finally, several inherent constraints and potential directions for further study are discussed.

2 Literature Review

According to the research that has been published to far, measuring BI performance or effectiveness—two concepts that are sometimes used interchangeably—is an intrinsically complicated issue. This is due to the fact that both practitioners and researchers continue to have a lot of concerns about the various measuring methodologies [4]. Numerous dependent constructs, as well as structure usage, client fulfilment, and remaining influence or profit, were used in related research to determine whether a BI was active or positive. According to a current organized evaluation research by (Massad et al. 2024) the is the model used the most frequently in BI effectiveness and achievement studies. Since its first release in 1992 [5]. As an alternative, some academics suggest consuming the individual advantage or effect of BI as a achievement metric. To evaluate individual advantages in the BI industry, a number of criteria have been used and created, including effort performance, individual efficiency, decision-making efficiency, and problem detection [6], that are recognized have an influence on BI performance in Jordanian businesses, established intangible metrics in Jordan to measure the effectiveness of BI, including increased production, inside procedures, decision creation, client facility, competitive value, and summary functional charges. They maintained that while achievement is measurable in theory, it is challenging to quantify in practice. In the situation of Jordanian commerce, this research uses imperceptible organizational profits as a proxy for BI structure. In this research, [4] stated that the primary problem that are recognized have an influence on BI performance in Jordanian businesses. Marzouk and Hanafy [7] the necessary structure use such like the BI structure, the researchers are seeking to quantify structure value rather than utilization. Since perceived usefulness in [8, 9], IS achievement model is seen from an ex-post viewpoint as opposed perspective in the context of IS usage, the former is conceptually distinct from the latter. Others included that Instead of the influence of structure usage on people and organizations, use is not crucial to the achievement of BI. Similarly, significant usage of BI technologies won't necessarily result in advantages for both individuals and organizations [10, 11], Instead, prolonged reliance on false or misleading information will have a negative impact on the selection of options and lead to a reduction in the value of the company. Therefore, it's critical that the appropriate clients use the right information in the correct situation at the correct period [12]

3 Hypothesis Formulation

Eleven related hypotheses have been developed based on the confident and important and positive expectations amongst the seven concepts: structure excellence, Information excellence, data excellence, exercise excellence, supposed advantage, client satisfaction, and firms' advantage in order to examine the relations amongst the

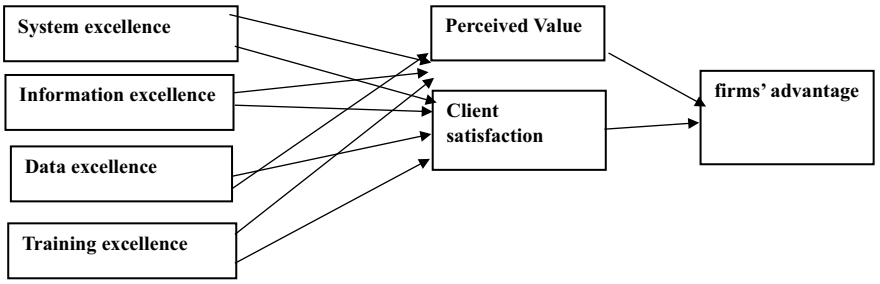


Fig. 1 Research model

constructions in the planned BI structure efficiency assessment model as shown in Fig. 1.

The research did not think it was rational to use single-construct measures of achievement. Instead, we reaffirm that it is oversimplified, inadequate, constrained, and potentially deceptive to evaluate the adoption of BI structures by organizations from the perspective of only one concept [13]. As suggested by earlier researchers, this study, relatively than concentrating on a specific component of achievement or single construct, focuses on significant factors that signify the achievement of a comprehensive structure for a variety of constructs that are employed. As a result, several viewpoints have been taken into account while constructing our model due to their enormous potential for assessing the efficacy of BI structure.

3.1 Structure Performance

Structure excellence is a widely acknowledged BI efficiency or achievement aspect. Businesses' growing reliance on BI structures motivates senior management to focus on enhancing their technical excellence. Structure excellence discusses the mechanical possessions of a structure in standings of combination, suppleness, convenience, reliability, reaction period, and additional metrics. Study [12] model discovered a favorable result in the BI setting. Shows client happiness is positively and statistically influenced by the excellence of the BI classification in relations of response rapidity, convenience, suppleness, and combination. The [14] model, which discovered a substantial association between Structure excellence and client pleasure with BI, produced the same outcome. Therefore, we speculate:

H1: The perceived value and BI Structure excellence are positively correlated.
H2: Client happiness and BI Structure excellence are positively correlated.

3.2 Reliable Information

Regarding the usefulness of BI, the issue of information excellence has attracted a great deal of scholarly attention, this is so that decision-making may be done effectively. BI analyses data with high stages of ambiguity and generates critical data with high grades of dependability [15]. According to DeLone and McLean (2016), information or production excellence denotes to the characteristics of information produced by a structure, such as relevance, dependability, setup, conciseness, money, timeliness, correctness, and other factors. This conclusion was supported by [16] who established a statistically important relationship among the information excellence concept and client satisfaction in the framework of business intelligence (BI). Therefore, we assume that:

H3. There is a positive link among perceived profit and the excellence of BI information.
H4. There is BI information excellence and client happiness have a good link.

3.3 Data Excellence

One of the main components for creating a positive company in the twenty-first period is data excellence. According to [17] effective statistics management and admission to data foundations may guarantee good data excellence, though extract, convert, and load procedures guarantee the correctness, consistency, and currency of the data. This is due to the fact that poor data excellence affects BI functionality and results in bad business choices [18], Since their absence might result in implementation failure, data excellence is therefore crucial to the achievement of BI (Almaaitah et al. 2024), By demonstrating that numerous real advantages exist to assist enhance clients' perceptions of values, numerous academics have exposed that data excellence has a favorable impact on those values and he found that excellent data excellence that satisfies clients' demands enhances decision-making and boosts the degree of fulfilment.

So, we propose:

H5. The perceived value and the excellence of BI data are positively correlated.
H6. BI data excellence and client satisfaction are positively correlated.

3.4 Training Standard

A crucial factor in determining BI efficacy is training excellence Due to the complexity of BI, poor training is another problem that is pertinent to problems with BI failure, BI exercise agendas might be of limited utility when consumers realize that training is an excess of time, that training time is incorrect, that the

trainers are incompetent, or that the training is insufficient [19]. The accessibility of exercise programs for clients has an impact on client fulfilment. Although earlier research has demonstrated that high-excellence client training influences perceived value and client happiness, the BI effectiveness study does not provide evidence to support this claim.

So, we make the following assumption:

H7. There is a positive connection among perceived value and BI training excellence.
H8. Client satisfaction and the excellence of BI training are positively correlated.

3.5 Perceived Value

In order for IS research to be effective, the perceived value construct has played a crucial role for almost three decades. Perceived value refers to how much a client thinks utilizing the BI would improve the excellence of his or her work and task performance [20]. Productivity, getting things done more quickly, making things simpler, and overall usefulness are the metrics to gauge the perceived value [21, 22]. In addition to criticizing, brought up model-related concerns [23] came to the same conclusion that around is a connection among organizational advantages and perceived profits thru the BI execution stage. It was discovered that perceived value positively correlated with firm's advantage. Consequently, we assume:

H9. Perceived value and client satisfaction have a positive link.
H10. Perceived value and organizational value are positively correlated.

3.6 Client Satisfaction

The main concept behind client satisfaction revolves around how clients feel about BI in terms of how well it meets their expectations [24]. The degree to which clients think the BI they have access to fits their work needs is referred to as client satisfaction (Zhao 2021; [25]). Due to its high validity, this section has been the greatest often employed construct to quantify BI achievement for a long period. Client happiness is a prerequisite for net organizational gains, according to the original and updated versions [26]. The results of (Almaaitah et al. 2024) provide evidence that there is a connection between client happiness and advantages or value to the organization. There is a strong correlation between organizational advantages and satisfaction with the IS, according to another study by (Zhao 2021).

As a result, we assume:

H11. Client happiness and organizational value are positively and significantly correlated.

4 Data Collection

Due to the organizational structure of the study, a key informant technique was employed to get information about the efficacy of BI in their companies. In organizational IS research, the use of key informants is common. Functional level to strategic level practical and business bosses who employ BI for decision-making in their organizations are the focus of this study. These responders are among the most knowledgeable about the efficiency of BI. Some of them are in charge of the administration of BI initiatives inside their organizations, while others are BI end clients in their respective lines of work. Instead, then expressing their own opinions, the informants were urged to provide those that were typical of their companies. The questionnaire was given personally to one defendant from each of the sampled corporations. The data gathering procedure was place between May and August of 2023. A 77% effective response rate was attained out of 171 prospective companies with 170 responses. After incomplete replies were disregarded, 150 responses remained, yielding a useful response rate of 66.6%. The determination of the minimal sample size is one of the most essential difficulties through Smart PLS. The "10-times rule" method is a popular minimum sample size estimation technique in Smart PLS.

Within the model. Given that the number of routes leading to the endogenic mechanisms in the planned model was 11, our sample size met the well acknowledged "10 times rule" and was thus adequate to provide credible Smart PLS results. This study therefore essential a minimum sample size of 110 applicants. We assessed the non-response bias during pre-data processing. The chi-square analysis,) suggested techniques, revealed no significant changes among initial and late answers with regard to important components at the significance level of 5%. As a result, it was determined that nonresponse bias was unimportant. When using self-reported data, associations may frequently be affected by common method bias. To address such a problem, the most reliable method for identifying common method bias in data was Herman's single-factor test. The test results, only about 29.7% of the covariance in our data can be attributed to a single component, which is less than the necessary 50%. Overall, it can be said that this study did not have a significant issue with common technique bias. The demographic traits, which are summarized in Table 1, also suggest that our sample is well representative.

5 Data Analysis

Using Smart PLS 4 software analysis, the suggested model and assumptions were empirically validated. This programme, which is frequently used in IS research like this one, can analyses complicated models and performs well with tiny data sets in order to ascertain loadings, path coefficients, determination coefficients, predictive relevance, and significant levels, a Smart PLS algorithm, predictive model, and

Table 1 Sample characterization

Constructs	Category	Degree	Proportion
Phase	Less than 30 years	11	0.096
	30–less than 40 years	43	0.377
	40–less than 50 years	51	0.447
	56 years and more	9	0.079
Teaching degree	Diploma	4	0.035
	Bachelor	72	0.632
	Master	31	0.272
	PhD	7	0.061
Situation degree	Managerial management	35	0.307
	Middle Management	56	0.491
	Operational Management	23	0.202
Practical part	General management	21	0.184
	Technology managment	34	0.298
	Fintech /Accounting system	11	0.096
	Supply chain	9	0.079
	Procedure/Manufacturing	12	0.105
	Marketing	13	0.114
	Human resource practices	11	0.096
	Others	3	0.026
Administrative involvement	Less than 2 years	2	0.018
	2–less than 5 years	42	0.368
	5–less than 10 years	51	0.447
	10 years and more	19	0.167
BI practice knowledge	Less than 2 years	3	0.026
	2–less than 5 years	55	0.482
	5–less than 10 years	47	0.412
	10 years and more	9	0.079
Business segment	Financial sector	64	0.561
	Industrial sector	21	0.184
	Service sector	29	0.254
Quantity of staffs	Less than 200	36	0.316
	200–500	51	0.447
	More than 500	27	0.237
Company proceeds	Less than $200 million	32	0.281
	$200–$500 million	53	0.465
	More than $500 million	29	0.254

Source(s) Authors own created

bootstrapping approach were employed. Two phases of the research model examination were conducted. The structural model was tested in the second stage, while the measurement model's validity and reliability were analyzed in the first. In this study, the measurement model was assessed first, then the structural model.

5.1 Measurement Model Analysis

See Table 2.

5.2 Structural Model Analysis

See Tables 3 and 4.

The relationship (H4: 50.465, p 0.05) among information excellence and client pleasure was supported. Both perceived value (H5: 50.740, p 0.05) and client fulfilment (H6: 50.317, p 0.05) are positively impacted by data excellence. However, training excellence has a favorable impact on client satisfaction (H8: 50.099, p 0.05) but no influence on perceived value (H7: 50.034, $p > 0.05$). It was established that perceived values had an effect on both client satisfaction (H9: 50.159, p 0.001) and firms' advantage (H10: 50.185, $p > 0.05$). Lastly, client satisfaction has a favorable impact on firms' advantage ($p = 0.001$, 50.488). As a result, in the framework of our research findings, H1, H3, and H7 were taken into consideration with no influence scope.

6 Analysis and Recommendation

In the structural situation of Jordanian firms, this article aims to build a thorough and multifaceted model for evaluating the efficiency of BI technologies. Theoretical underpinnings for the current work come from and other related investigations. This model describes how seven concepts—structure excellence, information excellence, data excellence, training excellence, perceived value, client happiness, and firms' madvantage—represent features of a particular BI effectiveness. Our data, which was gathered through instruments of 120 managers at Jordanian listed enterprises who utilize BI designed for strategic, tactical, and operational decision-making, was used to test the model. Eight of the eleven submitted hypotheses have empirical validity in the context of our data, according to the data analysis. Contrary to expectations, the perceived advantage was not significantly influenced by structure excellence.

Structure excellence is only a component of the larger and more comprehensive dimension known as structure integration, which provides a compelling argument in favor of this. Given this, the BI structure's technical capabilities may be required to

Table 2 Factor loading, reliability and convergent validity outcomes

Concept and measurement element	FL	CA	CR	AVE
Structure excellence		0.970	0.980	0.895
BI is stretchy	0.960			
BI is dependable	0.950			
BI is accessible	0.950			
BI permits statistics combination	0.930			
The answer time of our BI is satisfactory	0.940			
Information excellence		0.885	0.905	0.680
The information from our BI is useable	0.775			
The information from our BI is easy to access	0.770			
The information from our BI is understandable	0.715			
The information from our BI is always available	0.830			
The information from our BI is relevant for decision making	0.870			
Data excellence		0.820	0.820	0.650
The data underlying BI solutions are accurate	0.860			
The data underlying BI solutions are correct	0.855			
The data underlying BI solutions are consistent	0.770			
The data underlying BI	0.730			
Training excellence		0.965	0.975	0.905
The BI training offered were of adequate length and detail	0.955			
The kind of BI training improves the level of clients' understanding	0.935			
The training offered gave clients confidence in using BI	0.965			
The BI trainers were knowledgeable and competent	0.950			
Perceived value		0.800	0.815	0.635
BI upsurges individual efficiency	0.750			
BI improves individual performance	0.770			
BI improve higher-brilliance of decision making	0.850			
BI improve entities to achieve tasks more rapidly	0.800			

(continued)

Table 2 (continued)

Concept and measurement element	FL	CA	CR	AVE
Client satisfaction		0.950	0.940	0.900
BI has encountered our outlooks	0.900			
I am pleased with BI effectiveness	0.940			
I am fulfilled with BI efficiency	0.925			
I am pleased with BI on the complete	0.900			
Organizational standards		0.890	0.900	0.700
BI supports decision making	0.885			
BI decreases structural charges	0.850			
BI improves general efficiency	0.730			
BI improves competitive benefit	0.870			
BI improve business process variations	0.780			

Note(s) BI is known as business intelligence technology or structure
Source(s) Authors own created

Table 3 The correlation matrix

Concept	DE	IE	IB	PB	SE	TE	US
DE	–						
IE	0.750						
IB	0.850	0.570					
PB	0.870	0.550	0.550				
SE	0.120	0.185	0.130	0.055			
TE	0.070	0.120	0.115	0.090	0.105		
CS	0.850	0.845	0.630	0.710	0.230	0.165	–

Note(s) SE, structure excellence; IE, information excellence; DE, data excellence; TE, training excellence; PV, perceived value; CS, client satisfaction; IV, Institutional values
Source(s) Authors own created

guarantee that it functions regularly but may not be sufficient to offer advantages or affect clients' perceptions. Contrarily, our Results from empirical research confirmed the link between Structure excellence and client happiness. For BI clients, structure dependability, flexibility, integration, reaction speed, and simplicity of use are crucial factors. Therefore, it might be claimed that a well-designed structure based on practical qualities promotes client satisfaction with the BI structure. Unexpectedly, our findings did not demonstrate a positive connection among information excellence and perceived advantage.

The findings are consistent with the idea that when consumers opinion the information from the BI structure as favorable, they are more likely to be happy and I'm happy with it. As a result, our findings further confirm's claim that consumers will be happier with the BI structure if the information is of a better caliber. Data

Table 4 Outcomes of path analysis and hypothesis testing

Hypothesis path	B	T-value	*P*-value	F2	VIF	Supported
SE → PB	0.030	0.440	0.335	0.005	1.040	Not supported
SE → CS	0.131	2.485	0.009	0.060	1.050	Supported
IE → PB	0.003	0.025	0.495	0.001	1.725	Not supported
IE → CS	0.455	6.208	0.010	0.450	1.729	Supported
DE → PB	0.755	10.870	0.010	0.725	1.665	Supported
DE → CS	0.325	2.515	0.005	0.136	2.870	Supported
TQ → PB	0.035	0.550	0.290	0.007	1.035	Not supported
TQ → CS	0.095	1.855	0.035	0.035	1.035	Supported
PB → CS	0.160	1.710	0.045	0.045	2.200	Supported
PB → FA	0.189	2.320	0.015	0.035	1.615	Supported
US → FA	0.485	5.275	0.001	0.245	1.610	Supported

excellence is one of several factors that this study takes into account, and it is crucial to the achievement of BI structures. As predicted, the sole independent factor that influences equally perceived value and client satisfaction is data excellence. The client value and satisfaction with the BI structure were found to be enhanced by data correctness, precision, reliability, and completeness. This shows that having access to high-excellence data enhances client productivity, helps them do activities faster and with less effort, and ultimately raises their level of fulfillment by the structure. Surprisingly, perhaps there isn't enough evidence to support this link since training programs place more focus on structure usage characteristics such structure functioning, information accessibility, and simplicity of use than on the advantages of reporting and KPIs for everyday tasks and decision-making.

7 Research Limitation and Future Studies

Due to various constraints, there are more prospects for study in the future. Since objective data could not be obtained, we first and principally used self-reported perceived metrics to evaluate organizational value. When there are no accessible objective performance statistics, perceptual or subjective metrics might be used instead, however this could result in skewed results. Future research is likely to produce results that differ from ours by utilizing objective or monetary metrics like effectiveness and (ROI) or by employing balance sheet metrics. Due to our extremely small sample size, we chose not to employ the control factors that might potentially affect the dependent variable; nevertheless, future research incorporating controller variable star such firm size, manufacturing, or administrative provision to identify any potential effects on organizational advantages. Third, information was gathered from Jordan, a single cultural and geographic region.

Future studies are urged to examine our suggested model using information from various countries or cultural situations to determine whether the conclusions are generalizable. Fourthly, even if this study's sample size is smaller than what is required for the Smart PLS analysis, we accept that this is one of its drawbacks. Future research may thus expand on this model to gather more data that will improve the conclusions and more accurately reflect the population.

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Does Implementing Lean Management Have the Potential to Affect the Performance of an Organization?



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Abstract The main objective of this study is to explore the impact of the implementation of lean management in Jordanian pharmaceutical warehouses. The study attempted to examine the impact of lean management (focus on clients, standardization, and continuous improvement) on organizational performance. This study was applied to the five most popular Jordanian pharmaceutical warehouses located in Amman. To reach the purpose of this study, data were collected from 226 employees by using a questionnaire. (SPSS) program was used to analyze and examine the hypothesis. The results showed there is a significant positive impact of lean management (focus on the client, standardization, and continuous improvement) on organizational performance in Jordanian pharmaceutical warehouses at a level of ($\alpha \leq 0.05$). Moreover, the study recommended companies and pharmaceutical warehouses pay more attention to lean management and make the concept of lean management part of their culture.

Keywords Lean management · Organizational performance · Pharmaceutical warehouse

1 Introduction

Management is the foundation of any organization's success, whether it's in the field of business, health, service sector, and beyond. The impact of management practices is a critical determinant in the success or failure of economic entities [1]. Moreover, the cornerstone of organizational prosperity hinges on adept management that utilizes scientific methods for decision-making and undertakes various managerial tasks to innovate, grow, and adjust in response to both local and global circumstances [2].

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Consequently, the concept of lean management has emerged as a cutting-edge and contemporary approach increasingly adopted and implemented by businesses [3].

The efficiency of an organization's management is defined by its ability to react swiftly to changes and modify its operational methods to align with evolving demands [4]. In addition to effectively leveraging data and being agile in the face of challenges and prospects, this managerial style focuses on principles, optimizing processes and reducing waste, while continually striving for excellence through collaborative effort [5]. The goal is to maximize benefits for customers and minimize any non-value-adding activities for both the organization and its clients. Lean management represents a departure from the outdated and insular approach of traditional bureaucratic management, adopting a more streamlined and efficient strategy [6].

The Jordanian pharmaceutical warehouse sector was selected for study due to its significance within the industrial sphere and its overall impact on the Jordanian economy, owing to its competitive edge and substantial contributions [7]. Despite rapid advancements across various commercial and service sectors, companies within this sector face an increasing array of challenges and intense rivalry among peers. Moreover, these obstacles and shifts are not confined to specific levels or segments of a company; they span numerous facets and stakeholders with the potential to affect various aspects of the business, such as client contentment and the organization's reputation [8].

An examination of the practices in some pharmaceutical warehouses exposes pressing need for adopting lean management. This approach aims at minimizing waste, cutting down costs, enhancing service quality, catering to customer demands, and amplifying competitiveness and profitability. Lean management necessitates cultivating an optimal work environment, fostering a positive psychological climate, harnessing teamwork, employing oversight mechanisms, and investing in knowledge. It also encourages creativity and innovation, promotes transparency, combats bureaucratic delays, and adapts to contemporary changes [9]. Essentially, lean management offers a strategic blueprint for establishing a dynamic and evolving organization, directed at pinpointing, and resolving pressing issues [10].

The concept of organizational performance captivates both researchers and business executives due to its heightened relevance in an era of continuous and rapid change [11]. The implementation of lean management principles and best practices are focused on enhancing organizational performance to achieve the set goals and aspirations of the entity [36]. Lean management, as characterized by experts such as James Womack, Daniel Jones, and Daniel Roos, is explained in detail in their book "The Machine That Changed the World". Broadly, lean is understood as a mindset and collection of doctrines aimed at optimizing production (or service provision) and supply chains by eliminating any activities that do not enhance value to the product or service, thereby reducing inefficiencies [12, 13].

The Jordanian pharmaceutical warehousing sector is recognized as one of the most important levers of the national economy, and it has grown substantially because of its high efficiency and ability to compete both domestically and internationally. However, since observing the researcher working in drug stores for a sufficient period, it became clear to him that some Jordanian drug stores face several challenges and

obstacles in developing modern and contemporary administrative methods, poor management, and increased labor market competition. They also face a level of complexity and lag in production and customer service, particularly throughout the period 2020–2021 (Covid-19), which has resulted in this crisis increasing the weight and obstacles owing to changing conditions [14].

To stay competitive, warehouses that excel by employing the most current management techniques to address challenges must consider adopting and integrating modern management systems, such as lean management. In light of this, the problem statement for the study could be framed around the question: what is the role of lean management in enhancing organizational performance within Jordanian pharmaceutical warehouses? The objective of this research is, therefore, to examine the influence of lean management on the organizational performance of pharmaceutical warehousing operations in Jordan.

2 Literature Review

2.1 Lean Management

Lean management encapsulates an organization's competence in overseeing operational performance with a focus on rapid reaction to changes and the ability to rapidly modify working procedures to fulfill evolving requirements [15]. It aims to tackle difficulties and leverage opportunities in order to secure optimal outcomes for clients while striving to minimize any processes that fail to contribute value to the business or its customers [16]. Additionally, lean management streamlines operations by reducing the amount of time dedicated to superfluous tasks such as redundant actions, transportation, waiting periods, overproduction, etc., along with addressing quality complications and unnecessary complexity [17]. This approach is bolstered by a crucial element of management that ensures that the workforce operates in the most favorable environment possible [18].

While there is no universally principles for lean management, scholars generally align on a core set of guiding principles utilized by senior management to navigate the implementation of lean practices [19–21], which can be listed into three primary principles. First among these is the customer-focused principle, which underscores the value derived for customers as the primary driver for adopting lean management's emphasis on agility and efficiency [22]. It goes beyond internal organizational benefits, placing the effectiveness of the organization in interpreting and materializing customer needs at its heart, thereby integrating customers into the solution ecosystem rather than viewing them as part of the challenge [23].

The second principle is standardization, which involves setting explicit and precise performance benchmarks that facilitate the acceleration of task completion and ensure a seamless flow of production activities in line with established specifications [24, 25]. Implementing this principle demonstrates an organization's dedication to

and compliance with established processes and standards for accomplishing tasks [26]. It enables management to measure real achievements against predefined standards [27]. The clear description of work standards simplifies the oversight of tasks and activities across all units and enhances performance tracking [28, 29]. This, in turn, assists management in pinpointing and amending deficiencies and shortcomings within the operational processes.

Lastly, fostering continuous improvement is a key lean management principle that entails utilizing methods to evaluate an organization's current operations, identify necessary actions, recognize potential obstacles, and involve all organizational members in enhancing their work processes [30, 31]. This reflects the dynamic and adaptable nature of lean management, acknowledging that challenges may emerge related to any principle. By ensuring that every staff member is actively engaged in continual enhancement of operational processes, the company is better shielded against potential issues, maintaining its resilience and capability to evolve effectively [32, 33].

2.2 Organizational Performance

In recent times, the idea of performance has garnered considerable attention and is now a common term across all domains of human endeavor [34]. Performance is a subjective interpretation of reality, producing numerous scholarly deliberations on the concept and the array of tools used for its measurement. The term "organizational performance" is ubiquitous in educational discussion; however, precise definitions are inadequate [35, 36]. The several terminologies that are used to articulate performance give rise to growing dialogue on potential misunderstandings of the concept [37, 38]. Consequently, notions such as productivity, efficiency, effectiveness, economy, profitability, competitiveness, etc., are often conflated with the idea of organizational performance [39]. This has led to calls for a clear definition of performance to avoid ambiguity and ensure clarity in its understanding and application.

Satisfaction and productivity are indeed recognized as two critical aspects of an organization's performance [40, 41]. Customer satisfaction specifically is the emotional response a customer has upon assessing whether a product's actual performance meets or falls short of their expectations. If the product's attributes align with or better expectations, satisfaction is likely to be high; conversely, if they do not, disappointment may ensue. The model of customer satisfaction operates on a cause-and-effect basis, with factors influencing satisfaction—such as customer expectations, perceived quality, and perceived value [42, 43]. Central to the model is customer satisfaction itself, which then influences outcomes reflected on the model's right side. These outcomes include customer complaints and indicators of customer loyalty, such as customer retention and willingness to accept price variances [44].

Productivity is often measured as the proportion of produced output to the volume of inputs employed [45]. It is an efficiency indicator that measures the proficiency

with which an economy uses inputs like labor and capital to yield a particular level of output [46]. Recognized as a pivotal driver of economic growth and competitiveness, productivity provides essential data for comparisons and assessments of performance on both international and national scales [47]. Companies, which differ in structure and operational focus, typically employ varied approaches when measuring their productivity, customizing tools and methods to fit their distinctive needs [48]. Broadly, productivity measurement can be categorized into several types, including a focus on profitability, task completion, management of time, utilizing feedback, peer evaluations, correlating labor time with goods manufactured, tracking employee development, and investigating customer satisfaction. These diverse metrics collectively assist in comprehensively evaluating and enhancing company productivity [49]. The research model under discussion is encapsulated in Fig. 1.

Based on the previous discussion and in order to achieve the goal of this study, we formulated the following hypotheses:

H1: Focus on client has a positive impact on organizational performance.
H2: Standardization has a positive impact on organizational performance.
H3: Continuous improvement has a positive impact on organizational performance.

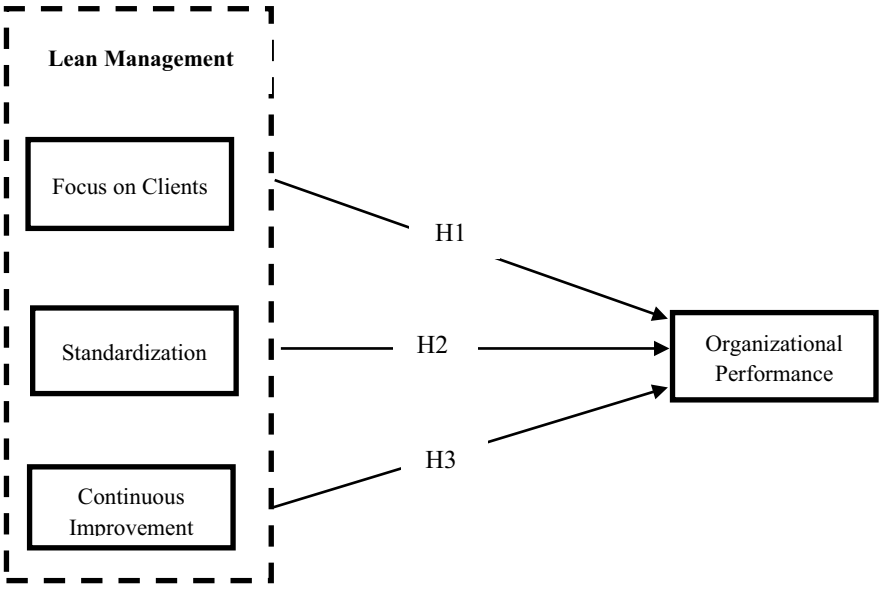


Fig. 1 The proposed model

Table 1 Pharmaceutical warehouses in Amman city

No.	Study population name	No. of employee
1	Khoury drug store	251
2	Sharaya drug store	64
3	Masrouji drug store	62
4	Orient drug store	85
5	Modern drug store	41

3 Methodology

The aim of this study is to understand the impact of the implementation of lean management on organizational performance in Jordanian pharmaceutical warehouses. Descriptive research contains gathering data to test hypotheses or answer questions about the current state of the subject of study. The survey research design was chosen for the study. The survey instrument was designed to collect information about people's attitudes toward lean management and organizational performance. However, during data collection, we maintained the highest standards of confidentiality and data protection, ensuring that all participant information was anonymized and securely stored. Informed consent was rigorously obtained from all participants, who were fully briefed on the purpose, methods, potential impacts, and significance of the study, affirming their voluntary participation without any undue pressure. Additionally, we actively identified and managed any potential conflicts of interest to preserve the impartiality and integrity of the research process. The study protocol, including the ethical considerations, received approval from the pharmaceutical warehouses, reflecting our commitment to uphold the ethical principles.

3.1 Research Population and Sample

The population of the study consists of all employees working in the Jordanian pharmaceutical warehouses located in Amman city. The researcher chose the most popular and collaboration warehouses to deliver questionnaires shown in the table below. These warehouses consist of (503) employees divided into three groups: managers (56), supervisors (61), and employees (386). Table 1 summarizes the total number of employees for each pharmaceutical warehouse distributed in Amman.

3.2 The Instrument Used

The questionnaire is the main data collection instrument for collecting the research primary data. The questionnaire includes three sections. The first section explained

Table 2 Sample demographic

Measure	Category	Count	Perc. %
Age	18–25	54	24
	26–35	54	24
	36–45	91	40
	Age > 45	27	12
Education	Secondary	18	8
	Diploma	27	12
	Bachelor	172	76
	High school	9	4
Gender	Male	99	44
	Female	127	56
Job position	Employee	140	62
	Supervisor	36	16
	Manager	50	22

the purpose of the questionnaire as well as the confidentiality undertaking that it will only be used for research purposes. The second section includes questions related to demographic information (gender, age, educational qualification, administrative level). The third section includes the measurement items related to the study. Such items adapted to a Likert-type graded scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2 and strongly disagree = 1). The collected data were keyed into the SPSS. Table 2 shows the demographic information of the sample.

4 Data and Results

4.1 Reliability

The reliability analysis was applied to the level of Cronbach Alpha (α), which is the internal consistency criterion that was at a minimum acceptable level (Alpha ≥ 0.60). These are the acceptable levels recommended. The results are shown in Table 3.

Table 3 Reliability test

Variable	No. of items	Cronbach's alpha
Focus on clients	9	0.899
Standardization	6	0.909
Continuous improvement	6	0.887
Organizational performance	4	0.928

Table 4 Results of multiple regressions analysis (coefficients)

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.652	0.181		3.592	0.195
Customer focus	0.445	0.062	0.396	7.182	0.014
Standardization	0.328	0.064	0.358	5.146	0.001
Continuous improvement	0.133	0.057	0.159	2.327	0.002

Dependent Variable: Organizational Performance

The results shown in Table 3 show that the shown values were close to (1), indicating that the research tool had a convincing internal consistency and reliability that served the research objectives.

4.2 Multiple Regression Analysis

Multiple regression test was used to examine the study hypotheses. Regression analysis is a statistical test utilized to explore the relationship between multiple independent variables and one dependent variable. The findings of such tests depicted that the research model explained 59.5% of the variance. Table 4 shows the coefficient table of multiple regression analysis. As shown in the table, three independent variables are statistically significant at the 0.05 level. Hence, H1, H2 and H3 are supported.

5 Discussion

The current study posed three main hypotheses and their relationship to the impact of the study variables placed within the study variables. The study produced several findings that may help improve organizational performance in Jordanian pharmaceutical warehouses. Based on the analyzed data and the study hypotheses tested previously, the study obtained the impact of lean management which consists of (focus on clients, standardization, and continuous improvement) on organizational performance in Jordanian pharmaceutical warehouses. The Result of this study shows that there is a significant implementation of lean management among the Jordanian pharmaceutical warehouses. All variables of lean management have a direct significant effect at Jordanian pharmaceutical warehouses organizational performance. This result is supported by previous studies conducted by [50–52].

All lean management variables influence organizational performance at Jordanian pharmaceutical warehouses. The continuous improvement had the highest effect on

organizational performance (Beta = 0. 368, t = 5.656, sig. < 0.001), followed by focus on client variable (Beta = 0.300, t = 5.718, sig. < 0. 00), then standardization (Beta = 0.264, t = 3.984, sig. < 0. 00). The focus on client was holding the highest effect on productivity (Beta = 0. 396, t = 7.182, sig. < 0.001), followed by standardization variable (Beta = 0.358, t = 5.146, sig. < 0. 00), then continuous improvement (Beta = 0.159, t = 2.327, sig. < 0. 00). This result is supported the previous studies, such as: [53–56].

6 Conclusion and Recommendation

The results show that participants agree on the high implementation of each Lean management variable (focus on clients, standardization, and continuous improvement), indicating that these variables are prevalent in Jordanian pharmaceutical warehouses. Moreover, the overall result indicates that there is a significant implementation of the lean management among Jordanian pharmaceutical warehouses. This indicates that the managers and supervisors working at Jordanian pharmaceutical warehouses realize the importance of the implantation of the lean management variables. The results also show that the relationships and correlation between lean management and organizational performance is strong. The relationships and correlation between each variable of Lean management and organizational performance dimensions are strong too.

Finally, the current study indicates that all lean management variables influence Jordanian pharmaceutical warehouses' organizational performance. Continuous improvement had the highest effect on organizational performance, followed by a focus on client variable and then the standardization variable. The focus on client was holding the highest effect on productivity followed by the standardization variable and then continuous improvement variable.

Based on the findings of this research, the following suggestions are proposed to enhance organizational performance in businesses and warehouses:

1. Companies are encouraged to deploy lean management as a strategic tool to elevate their performance levels.
2. It is recommended that specialized training programs on lean management implementation be developed for both managers and staff.
3. Organizations should consider designating a lean management expert to oversee and manage lean initiatives.
4. Entities keen on integrating lean principles should be supported and motivated to do so, as it presents substantial prospects for enhancing productivity, customer satisfaction, operational efficiency, and maintaining a competitive stance in the market.
5. Businesses are advised to integrate lean management principles into their operational models, tailoring them specifically to their unique business requirements, and to embed the lean management standards into their organizational culture.

However, while this study provides insights into the potential effects of implementing lean management on organizational performance, there are several avenues for future research that can expand upon these findings. Further studies could explore the long-term impacts of lean management practices by employing a longitudinal research design that allows for the observation of performance changes over extended periods. Moreover, future research may benefit from incorporating a multi-industry comparative analysis to determine the generalizability of the results across different sectors. Moreover, investigating the mediating role of organizational cultural between lean practices and process effectiveness could also offer valuable contributions.

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The Moderating Role of Firm Size on the Relationship Between Intellectual Capital and Firm Performance Among Industrial Companies Listed on Palestine Exchange (PEX) and Amman Stock Exchange (ASE) for the Period 2016 to 2022



Ghassan Daas and Abeer Yahya

Abstract The literature assess the effect of "intellectual capital (IC)" on the performance of the firms and whether firm size can moderates the relationship between "intellectual capital" and "firm performance". The study uses secondary data from annual reports of listed industrial firms on "PEX and ASE" to measure "human capital efficiency (HCE)", "structural capital efficiency (SCE) and "Capital Employed Efficiency" (CEE)" as components of IC in the value-added intellectual coefficient model (VAICTM) and corporate performance indicators "(ROA, ROE, ATO, and EPS)". The study sample includes 44 industrial companies on "PEX and ASE" for the period 2016 to 2022. Multiple regression analysis was used to analyze the data. The study finds with the moderation effect that for industrial companies listed on PEX, HCE has a positive impact on ROE, EPS and ROA. Negative impact of SCE on ROE, and positive impact of CEE on ATO. However, for industrial companies on the ASE, SCE has a negative impact on ROE, whereas CEE have positive impact. Other variables have no impact. The results show that for industrial firms listed on "PEX and ASE", the firm size variable only moderates the relationships between IC and firm performance. The study recommends that the Industrial companies have to disclose in their annual reports all components of IC represented in "HCE, SCE, and CEE".

Keywords Value-added intellectual coefficient model (VAICTM) · Intellectual capital (IC) · Human capital efficiency (HCE) · Structural capital efficiency (SCE) · Capital employed efficiency · Firm performance · ROA, ROE, ATO, EPS, firm size

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1 Introduction

The International Financial Reporting Standards (IFRS) dictate that financial statements should accurately reflect a company's current value. However, these standards tend to prioritize physical and monetary assets over intangible ones, such as "intellectual capital" (IC), even if they are significant and relevant to users. IC is a valuable asset for companies as it represents their knowledgeable base. Unfortunately, the exclusion of IC from financial statements means that they do not fully capture the company's true value [1]. To address this limitation, researchers have developed models that recognize, measure, and disclose IC, solving the recognition and measurement problem [2].

As a result of moving from a production economy into a knowledge economy as a basic resource of value creation in modern economics, knowledge plays a more vital contributor resource than "physical and financial assets" in generating sustainable competitive advantages and superior performance [3]. According to the resources-based theory, the competitive advantages of the company depend on the capabilities and resources the organization possesses, and those resources contain both "tangible and intangible" assets [4]. IC is recognized as the knowledge that may be converted into value for driving sustainable competitive advantages and long–term superior performance [2]. It contains three basic components which are "human capital efficiency (*HCE*)" relying on employees' skills, experiences, knowledge, and innovation, "structural capital efficiency (SCE)" which depends on databases, software, computers, and patents, and "capital employed efficiency (CEE)" which refers to the relationships between the company and the customers The "value-added intellectual coefficient model (*VAICTM*)" is a model created by Anti Public. It is considered the best way to measure the "efficiency of intellectual capital's" contribution to a company's value creation.

The (VAICTM) model measures three components: "physical capital, structural capital", and "human capital" that form the value of the company [5]. In addition, firm performance expresses the health of the company during a given period [6]. Various financial ratios can be used to measure "firm performance (FP)" such as "return on assets (ROA)", and "return on equity (ROE)" represent profitability. While "assets turnover (ATO)" measures productivity, and earning per share to evaluate the performance of companies [3]. Whereas firm size is used as a fundamental characteristic of a company which refers to the size of companies at a given period [7]. Most researchers have studied the direct impact of IC on FP such as [1–3, 8–11]. This study is based on investigating the moderating role of firm size on the relationships between IC and FP.

2 Problem Statement

IC as a form of intangible asset has a salient role in a firm's performance. Most prior research investigated the direct relationships between IC and FP by using qualitative measures of IC such as HCE, SCE, CEE, and financial ratios as a measure of FP represented in ROA, ROE, ATO, and EPS. Such as [1–3, 8–11]. However, the investigation of the moderating role of firm size on the relationships between "intellectual capital" and firm performance has not been discussed yet in "PEX and ASE". The main question of this study is "What is the moderating role of firm size on the relationship between IC and FP for industrial companies listed on "PEX and ASE"? And the next sub-question addressed:

(1) What is the effect of "human capital efficiency (HCE)", on the FP among industrial listed companies listed on "PEX and ASE"?
(2) "What is the effect of structural capital efficiency (SCE)" on the FP among industrial companies listed on "PEX and ASE"?
(3) "What is the effect of "Capital Employed Efficiency" (CEE)" on the FP among industrial companies listed on "PEX and ASE"?
(4) What is the "moderating role of firm size on the effect of HCE, SCE, and CEE"" on the FP among industrial companies listed on "PEX and ASE"?

3 Research Importance

The importance of research emerges from the gap related to exploring the moderating role of firm size on the relationships between IC and FP". The result of this study will be useful for the industrial companies sector seeking to evaluate the importance of IC on an FP and how firm size moderates the impact of IC on FP [3]. Moreover, stakeholders can identify the factors that can affect FP. This study tries to ensure the disclosure of IC by managers is fruitful [1].

4 The Research Objectives

Based on the study problem, the study tries to achieve the following objectives:

(1) Exploring the nature and existence of IC components in industrial companies.
(2) Investigating the effect of "IC components" and the FP in industrial companies.
(3) Understanding how firm size moderates the effect of IC components on FP.

5 Theoretical Framework and Hypothesis Development

Resources-based view (RBV): Penrose (1959) first developed the resource-based perspective which has become the dominant theory in strategic management [4]. This theory is utilized to decipher and examine a company's resources, to attain long-lasting competitive advantages and excellent performance. RBV suggests that a company's competitive advantages stem from its abilities and resources, which consist of both "tangible and intangible" assets, which the human resources capital (IC) is included. RBV proposes that the firm competitive advantage depends on the capabilities and resources that the organization possesses, and those resources contain both "tangible and intangible" assets [1]. RBV stipulates the connection between intangible assets represented in IC and capabilities, resources, profitability, and competitive advantages and investigates the effect of these connections on achieving sustainable competitive advantages and superior performance [12].

Knowledge-Based View (KBV)

As suggested by the resources-based view, it focuses on resources and capabilities inside of the companies including "tangible and intangible" assets. So, the "Knowledge-Based View" is considered as the recent extension for RBV of a company which relates to knowledge within the organization that cannot be easily imitated by rivals [13]. The KBV of a firm analyzes and interprets four attributes of skills represented in (1) skills and knowledge of employees, (2) database and management system, (3) control process, and (4) construction of knowledge [12]. Sustained competitive advantages and superior performance highly rely on Knowledge resources which are considered primary components of IC. It can simplify the success of a firm [4].

Firm performance (FP): Firm performance (FP) is considered a dependent variable. This refers to the ability of the company to exploit its available resources efficiently and effectively to achieve its desired goals, with consideration of their relevance to the current and potential users [6]. The "resource-based view" focuses on both "tangible and intangible" assets to measure benefits and competitive advantages for a company. Whereas measures of financial performance are considered as a dominant model in determining business performance. Many measures have been used to measure profitability, productivity, and market evaluation. "ROA and ROE" represent profitability. While ATO measures productivity. And EPS to evaluate the performance of companies. ROA is an indicator that relates to the company's ability to create profits from the resources invested in it, and show the firm's competency in utilizing its assets [10]. ROE is an indicator that refers to the efficiency of the company in bringing income from stakeholders' money that has been invested [2]. Whereas ATO is a financial indicator that measures the efficiency of the company in using its resources to bring revenues. ATO is computable as total revenue divided by total assets [10, 14]. EPS is a financial indicator that is used by financial analysts to evaluate the performance of companies. It refers to the monetary amount of profits per outstanding common shares during the accounting period [4].

"Intellectual capital": International Accounting Standard 38 (IAS38) define "intangible assets" as non-monetary resources that lack physical substance. These resources can be identified if they are separable or arise from legal or contractual rights, such as computer software, trademarks, databases, and patents. The standard requires that intangible assets be clearly defined and only recognized if there is a potential future economic benefit and their cost can be reliably measured. Despite ongoing debates, there is still no consensus on a universal interpretation of IC [9]. It is defined as the differences between market value and book value known as IC [10], while [2] view "intellectual capital" as knowledge that can generate value and fuel sustainable competitive advantages and long-term success. The fundamental components of "intellectual capital" include "HCE, SCE, and CEE".

Human capital Efficiency (HCE): Human capital is a crucial element of intellectual wealth and creativity. It refers to a business's capacity to reap advantages from its employee's skills, experiences, knowledge, and innovation [8]. It depends on the personal characteristics of employees such as education, entrepreneurship, leadership, and experiences [15]. Most previous studies found a positive effect of HCE on FP. such as, [10] found a positive impact of IC on firms' productivity measured by ATO, [3] indicated a positive effect of HCE and FP represented in ROA and ROE. [4] Found a positive impact of HCE on FP measured by ROA and EPS. Depending on these earlier studies, the first hypothesis is:

> **Hypothesis 1** There is a positive effect of HCE on FP of industrial companies listed on "PEX and ASE".

Structural capital (SC): Structural capital also known as organizational capital [10] "Organizational or company value refers to the assets owned by a firm that persist even after employees leave, such as the company's systems, intellectual properties, operations, structure, and other intangible resources. Knowledge management systems play a crucial role in supporting employees' performance within a business by facilitating the creation, sharing, and transfer of knowledge" [16]. There are two main components to SC: infrastructural resources used in organizational activities, and knowledge innovation, such as patents, copyrights, and databases [14]. According to the resource-based view, SC cannot be substitutable easily so it is an important source of sustainable competitive advantages [1].

Most studies have suggested a positive impact of SCE on FP such as [10] revealed a positive impact of SCE on productivity measured by ATO, whereas [1] found a significant positive effect of SCE on ROA and an insignificant positive effect of SCE on ROE

Al Momani et al. [4] found that ROA and ROE were significantly affected by SCE. However, [3] indicated there is no association between SCE and profitability measured by ROA and ROE. Depend on these earlier studies, the second hypothesis is:

> **Hypothesis 2** There is a positive effect of SCE on FP of the industrial companies listed on "PEX and ASE".

"Capital Employed Efficiency": Capital employed is a key component of "intellectual capital" (IC). It refers to the intellectual resources that are used to manage and regulate a company's relationships with its stakeholders, such as government, society, clients, suppliers, and marketing channels. These stakeholders create the environment of the firm, and maintaining and expanding relational capital is crucial for obtaining new resources and achieving long-term superior performance for a company [11, 17].

There is a difference in the findings of the studies about the effect of CEE on the FP. Agomor [1] stated that CEE enhances the firm's profitability measured by ROA and ROE. Whereas, Al Momani [4] didn't find any association between CEE and ROA and ROE. Xu and Liu [3] revealed the productivity of the firm is positively affected by CEE and the profitability of the firm is negatively impacted by CEE. Depending on these earlier studies the third hypothesis is:

> **Hypothesis 3** There is a positive effect of CEE on the FP of the industrial companies listed on "PEX and ASE"**.**

Firm size: Firm size is considered a moderating variable in the current study. It is a fundamental characteristic of a company and measures the natural logarithm of a company's total assets at a given period [7]. Most previous studies used firm size as a control variable and they indicate a positive impact of firm size on FP that means when a company gets bigger in size of total assets will increase the ability to develop FP by optimal usage of available resources [1–3, 10]. According to our knowledge, this study is the first study to investigate the moderating role of firm size on the relationship between IC and FP. Then, the expected fourth hypotheses is:

> **Hypothesis 4** There is a moderating role of firm size on the effect of IC on FP of industrial companies listed on "PEX and ASE".

6 Method and Procedures

6.1 Population and Sample

This study employs the quantitative approach, which encompasses all numerical data—primary or secondary—in its methodology. The annual reports of all industrial firms on the "PEX and ASE" during 2016–2022 and the websites of the companies serve as the secondary data source for the current study. The study's sample was chosen using the following standards: Throughout the research period, the company needs to be operational and listed on "PEX and ASE", the business is required to include all components of VAICTM in its published annual reports (Table 1).

Table 1 The study population

Subsector	Population	No. of companies listed in PEX	No. of companies listed in ASE	Percentage
1	Pharmaceutical and medical industries	3	3	13.6
2	Chemical industries	0	5	11.4
3	Food and beverages	3	7	22.7
4	Tobacco and cigarettes	1	1	4.5
5	Mining and extraction industries	2	7	20.5
6	Engineering and construction	2	7	20.5
7	Electrical industries	0	2	4.5
8	Textiles, leathers and clothing	0	1	2.3
Total		11	33	100

6.2 Variables

1. **Independent variable**: the "value-added intellectual coefficient model (VAICTM)" is regarded as the most effective means of gauging the effectiveness of "intellectual capital" in generating value for the organization. There are various reasons for using the VAICTM model in the current study: first: quantitative method that depends on real and historical data from financial statements; second: reliability and objectivity of data that are obtained from audited financial statements; third: easily to understand by management and stakeholders [18]. The (VAICTM) model measures three components "human capital, physical capital, and structural capital" that comprise the company's worth [5]. There are five steps to measure "intellectual capital" (Table 2).

2. **Dependent, moderating and control variables**

The "Firm performance" is a dependent variable. Which is measured by "ROA, ROE, ATO, and EPS". Firm size is a moderating variable. While control variables are represented in leverage and firm age (Table 3).

7 Results

The following two regression models were constructed using the annual reports of industrial firms listed on the "PEX and ASE" to test the effect of IC on FP as well as the moderating effect of firm size on the relationship between variables.

Table 2 Calculation of VAICTM

First step:	"Calculation of value added (VA)" [4]. "VA = OP + HC + D + I + DI + T" Where: "OP = Operating profit of company, HC = Employee cost, D = Depreciation, I = Interest, DI = Dividend, T = Tax"
Second step	Estimation of "Human Capital Efficiency (HCE)" [2], HCE = VA / HC
Third step	Estimation of "Structural capital Efficiency (SCE)" [10] SCE = SC / VA "SC = VA – HC" Where: "SC = "Structural capital"
Fourth step	Estimation of "Capital Employed Efficiency" (CEE) [3] "CEE = VA / CE" "CE = Capital employed = Total assets – Total liabilities"
Fifth step:	Estimation of VAICTM [1] VAICTM = HCE + SCE + CEE

Model 1a—$FP = \alpha 0 + \beta 1HCE + \beta 2SCE + \beta 3CEE + \varepsilon$.
Model 1b—$FP = \alpha 0 + \beta 1HCE + \beta 2SCE + \beta 3CEE + \beta\ 4\ FLEV + \beta 5\ FAGE + \varepsilon$.
Model 2—$FP = \alpha 0 + \beta 1HCE1 + \beta 2SCE1 + \beta 3CEE1 + \varepsilon$.

Where

$\alpha 0$: represent Intercept; β 1–6: represent regression coefficients; FP: Firm performance; HCE: Human Capital Efficiency; SCE: Structural Capital Efficiency; CEE: "Capital Employed Efficiency"; FLEV: Financial leverage; FAGE: Firm age; FSIZ: Firm size; ε: error term.

HCE1 = moderating the independent variable by firms size (HCE * size)
SCE1 = moderating the independent variable by firms size (SCE * size)
CEE1 = moderating the independent variable by firms size (CEE * size)

7.1 The Impact of IC Components on ROA

According to Table 4, the "coefficient of determination (R2)" for the industrial companies on PEX was 4.3%. This indicates that only 4.3% of the variation in ROA is accounted for the independent variables "HCE, SCE, and CEE". In contrast, for the industrial companies on ASE, the coefficient of determination (R2) reached 10.3%, which is higher compared to Palestinian industrial companies. To determine whether there is a multicollinearity between independent variables in the regression model, we used VIF. Table 4 shows that there is no internal correlation between independent variables as the VIF is less than 5, indicating no multicollinearity. Based on the findings, we can conclude that there is no significant effect of each of "HCE, SCE, and CEE" on the ROA of the industrial companies on PEX. On the other hand, for the industrial companies on ASE, there is no significant effect for both "HCE and SCE on ROA", but there is a significant effect of CEE on ROA.

Table 3 Measurement of the variables

Type of variable	Variable	Definition	Measurement	References
Independent variable	Intellectual capital	The variations between book value and market value	VAICTM = HCE + SCE + CEE	[4]
Dependent variables	"Return on assets (ROA)"	The capacity of a business to turn a profit from the invested assets. It is a profitability indicators represented by "Return on Assets (ROA) or Return on Investment (ROI)",	Net income as a percentage of total assets	[19]
	"Return on equity (ROE)"	The efficiency of the company in generating income from stockholders' money that have been invested	Net income as a percentage of total equity	[20]
	"Assets turnover ratio (ATO)"	The efficiency of company in using its resources to create revenue	Total revenues as a percentage of total assets	[21]
	Earnings per share (EPS)	The monetary amount of profits per outstanding common shares during accounting period	Net income as a proportion of all outstanding common shares	[11]
Moderating variable	Firm size	Size of industrial companies at a given period	Natural logarithm of the company's total assets	[2]
Control variables	Financial leverage(FLEV)	Financial ratio that measures the ability of the company to pay its obligation	Ratio of total debts divided by total assets	[22]
	Firm age(FAGE)	The duration of the company's operations, counting from the year of founding to the present	Natural logarithm of the current year of the company minus the formation year	[4]

Table 4 The impact of IC on ROA

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F-sig	DV
1a	0.208	0.043	0.355	ROA	1	0.321	0.103	0.000	ROA
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		− 0.009	0.860		(Constant)		0.036	0.000	VIF
HCE		− 0.001	0.821	2.699	HCE		3.629E−05	0.786	1.004
SCE		0.114	0.226	2.578	SCE		0.004	0.328	1.002
CEE		0.050	0.499	1.084	CEE		0.000	0.000	1.003

Table 5 The impact of IC on ROE

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1a	0.233	0.0540		ROE	2	0.221a	0.049	0.010	ROE
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		0.066	0.352		(Constant)		0.057	0.000	VIF
HCE		0.008	0.183	2.699	HCE		0.00003	0.906	1.004
SCE		− 0.015	0.904	2.578	SCE		0.002	0.835	1.002
CEE		0.080	0.413	1.084	CEE		0.000	0.001	1.003

7.2 The Impact of IC Components on ROE

According to Table 5, the industrial companies on PEX have a coefficient of determination of 5.40%. This means that 5.40% of the variation in ROE is accounted for by the independent variables represented in "HCE, SCE, and CEE". On the other hand, the industrial companies on ASE have an R2 of 4.9%, which is lower than that of the PEX companies. The VIF is less than 5. The results indicate that there is no effect of "HCE, SCE, and CEE" on the ROE of the industrial companies on PEX. For the industrial companies on ASE, there is no effect of HCE and SCE on ROE, but there is an effect of CEE on ROE.

7.3 The Impact of IC Components on ATO

Table 6 examines the relationship between the components of IC and assets turnover (ATO). The results show that the coefficient of determination (R2) for PEX companies is 34.3%, while for ASE companies, it is 100%, indicating that the independent variables in the model account for all the variation in ATO for ASE companies, the result seems strange, but this is the fact. Previous studies concentrate of ROA and EPS [4], without having the ATO into consideration, so the result can't be verified for the Jordanian firms. The VIF is less than 5, indicating no multicollinearity between the independent variables. The impact of HCE, SCE, and CEE on ATO is significant for PEX companies. However, for ASE companies, only HCE and CEE affect ATO, while SCE has no significant impact.

7.4 The Impact of IC Components on EPS

According to Table 7, the coefficient of determination (R2) for industrial companies on PEX is 29.3%. This indicates that 29.3% of the variation in EPS can be explained

Table 6 The impact of IC on ATO

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1a	0.585	0.343		ATO	3	1.000a	1.000	0.000	ATO
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		0.255	0.142		(Constant)		0.486	0.000	VIF
HCE		− 0.062	0.000	2.699	HCE		− 0.037	0.000	1.004
SCE		0.623	0.041	2.578	SCE		− 0.015	0.640	1.002
CEE		0.566	0.020	1.084	CEE		0.812	0.000	1.003

Table 7 The impact of IC on EPS

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1a	0.542	0.293	0.00	EPS	4	0.552a	0.305	0.296	EPS
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		− 37.181	0.001		(Constant)		0.204	0.001	VIF
HCE		− 0.139	0.877	2.699	HCE		4.437E−6	0.998	1.004
SCE		33.212	0.081	2.578	SCE		0.026	0.633	1.002
CEE		70.840	0.000	1.084	CEE		0.009	0.000	1.003

by the independent variables represented in HCE, SCE, and CEE. On the other hand, the coefficient of determination (R2) is 30.5% for industrial companies on ASE. The independent variables do not exhibit multicollinearity. There is a positive effect of CEE on EPS for the industrial companies on both "PEX and ASE", and there is no impact of HCE and SCE on EPS for both companies listed ln "PEX and ASE".

7.5 The Impact of IC Components on ROA in the Presence of Control Variables

Table 8 displays the influence of IC elements on the ROA in the presence of control variables. The results observed that the coefficient of determination (R2) for industrial companies on PEX is 15.8%. This percentage is higher than the coefficient of determination in Table 4. It means that control variables have a significant impact on increasing R2. The coefficient of determination (R2) for industrial companies on ASE is 22.6%. This percentage is also higher than the coefficient of determination in Table 4. It indicates that R2 is significantly influenced by control variables.

With the presence of the control variables the IC elements have no significant impact on ROA for Palestinian companies, but CEE impact the ROA for the Jordanian firms. The result was consistent with that of Table 4.

Table 8 The impact of IC on ROA in the presence of control variables

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1b	0.398a	0.158	0.029	ROA	5	0.476	0.226	0.000	ROA
IV	B	Sig	VIF	IV	B	Sig			
(Constant)	0.118	0.293		(Constant)	0.043	0.051	VIF		
HCE	0.007	0.175	3.667	HCE	3.81E−05	0.760	1.006		
SCE	− 0.033	0.746	3.304	SCE	0.004	0.257	1.005		
CEE	0.079	0.271	1.118	CEE	0.000	0.000	1.013		
AGE	4.868E−05	0.998	1.103	AGE	0.007	0.252	1.040		
LEV	− 0.214	0.003	1.408	LEV	− 0.088	0.000	1.030		

7.6 The Impact of IC Components on ROE in the Presence of Control Variables

According to Table 9 in the presence of control variables, the findings indicate that the coefficient of determination (R2) for industrial companies on PEX is 11.8%, which is higher than the coefficient of determination in Table 5. This suggests that control variables may have an important role in raising R2. On the other hand, the coefficient of determination (R2) for industrial companies on ASE is 5.03%, which is also significantly affected by control variables, as evident in Table 5.

With the presence of the control variables the IC elements (SCE, CEE) have no significant impact on ROE, where, HCE has for Palestinian companies, but CEE only has an impact on ROE for the Jordanian firms. The result was consistent with that of Table 5 for the Jordanian firms, but inconsistent for the Palestinian firms.

Table 9 The impact of IC on ROE in the presence of control variables

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1b	0.344	0.118	0.105	ROE	6	0.230	0.053	0.031	ROE
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		0.233	0.128		(Constant)		0.029	0.512	VIF
HCE		0.015	0.025	3.667	HCE		3.629E−05	0.883	1.006
SCE		− 0.158	0.248	3.304	SCE		0.001	0.858	1.005
CEE		0.105	0.284	1.118	CEE		0.000	0.001	1.013
AGE		− 0.011	0.731	1.103	AGE		0.010	0.411	1.040
LEV		− 0.215	0.026	1.408	LEV		− 0.012	0.710	1.030

Table 10 The impact of IC on ATO in the presence of the control variables

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1b	0.660a	0.435		ATO	7	1.000	1.000	0.000	ATO
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		− 0.086	0.808		(Constant)		0.586	0.002	VIF
HCE		− 0.089	0.000	3.667	HCE		− 0.037	0.000	1.006
SCE		1.127	0.001	3.304	SCE		− 0.013	0.678	1.005
CEE		0.457	0.048	1.118	CEE		0.812	0.000	1.013
AGE		− 0.025	0.728	1.103	AGE		− 0.002	0.967	1.040
LEV		0.723	0.002	1.408	LEV		− 0.267	0.043	1.030

7.7 *The Impact of IC Components on ATO in the Presence of Control Variables*

Table 10 analyzes findings show that the coefficient of determination (R2) for industrial companies on PEX is 43.5%, which is higher than the R2 in Table 6. This indicates that the control variables have a significant impact on increasing R2. On the other hand, the R2 for industrial companies on ASE is 100%, which is a strange results, but this the fact.

With the presence of the control variables the all IC elements have significant impact on ATO, for Palestinian companies, but HCS and CEE only has an impact on ATO for the Jordanian firms. The result was consistent with that of Table 6 for the Jordanian and Palestinian firms.

7.8 *The Impact of IC Components on EPS in the Presence of Control Variables*

Table 11 findings show that the coefficient of determination (R2) for industrial companies on PEX is 30.1%, which is higher than the coefficient of determination in Table 7. This indicates that control variables play a significant role in increasing R2. The coefficient of determination (R2) is 33% for the industrial companies on ASE, revealing that control variables also play a significant role in these companies.

With the presence of the control variables the IC elements only (CEE) have significant impact on EPS for both firms in "PEX and ASE". The result was consistent with that of Table 7 for the Jordanian firms, and Palestinian firms.

Table 11 The impact of IC on EPS in the presence of control variables

Palestine					Jordan				
"Model"	R	R Square	F-sig	DV	"Model"	R	R Square	F sig	DV
1b	0.548	0.301		EPS	8	0.574	0.330	0.000	EPS
IV		B	Sig	VIF	IV		B	Sig	
(Constant)		− 19.003	0.428		(Constant)		− 0.472	0.135	VIF
HCE		0.002	0.999	3.667	HCE		0.000	0.923	1.006
SCE		29.071	0.179	3.304	SCE		0.021	0.701	1.005
CEE		70.284	0.000	1.118	CEE		0.009	0.000	1.013
AGE		− 3.677	0.449	1.103	AGE		0.219	0.010	1.040
LEV		− 7.914	0.597	1.408	LEV		− 0.192	0.395	1.030

7.9 The Impact of Firm Size on the Relationship Between IC Components and ROA, ROE, ATO, and EPS.

The moderating effect was solarized in Table 12. The results investigate the significant impact before and after the moderating effect through P-Value (Sig). For the Palestinian companies, the moderating effect of the firm size on ROA was for HCE1, ROE for HCE1 and SCE1, ATO for CEE1, and EPS for HCE. While for the Jordanian companies the significant impact after the moderating effect was on ROE for both SCE1 and CEE1.

There is a variation in the results between the two markets. The Palestinian market is more sensitive for the moderating impact of the firm size. The results can be interpreted by the capital volume invested in the Jordanian industrial firms and the number of the industrial firms listed in the exchange markets.

8 Conclusions

The current study investigates the moderating role of firm size on the relationship between "intellectual capital" and firm performance among industrial companies on Palestine Exchange and Amman Stock Exchange. Firstly, there is a negative impact of HCE on ATO, but there is no effect of HCE on ROA, ROE, and EPS. In the presence of control variables represented in firm age and financial leverage, the results display there is no-significant impact of HCE on ROA for industrial companies on "PEX and ASE". The control variables don't play a role on the impact of HCE on ROA. But there is a positive effect of HCE on ROE for industrial companies on PEX. The control variables play a significant role on the impact of HCE on ROE. Those findings agreed with the resources based theory that explain that the spending on employees are considered as investment to improve financial performance [3, 4].

Table 12 Impact of firm size on the impact of IC on "**ROA, ROE, ATO, and EPS"**

IV	Palestine				Jordan			
	B Coefficients	Sig before	Sig after	Conclusions	B Coefficients	Sig before	Sig after	Conclusions
ROA								
HCE1	0.001	0.821	0.028	Moderating Positive impact	1.122E−5	0.786	0.456	No Moderating impact
SCE1	− 0.002	0.226	0.167	No Moderating impact	0.000	0.328	0.776	No Moderating impact
CEE1	0.008	0.499	0.106	No Moderating impact	2.584E−5	0.000	0.006	No Moderating impact
ROE								
HCE1	0.001	0.183	0.000	Moderating Positive impact	0.000	0.906	0.685	No Moderating impact
SCE1	− 0.005	0.904	0.002	Moderating Negative impact	− 0.037	0.835	0.005	Moderating Negative impact
CEE1	0.013	0.413	0.037	No Moderating effect	9.004E−5	0.001	0.760	Moderating Positive impact
ATO								
HCE1	− 0.003	0.000	0.000	No Moderating impact	− 0.003	0.000	0.000	No Moderating impact
SCE1	0.011	0.041	0.012	No Moderating effect	0.003	0.640	0.136	No Moderating impact
CEE1	0.023	0.020	0.144	Moderating Positive impact	0.056	0.000	0.000	No Moderating impact
EPS								
HCE1	0.121	0.877	0.014	Moderating Positive impact	1.149E−5	0.998	0.912	No Moderating impact
SCE1	− 0.297	0.081	0.277	No Moderating impact	0.003	0.633	0.240	No Moderating impact
CEE1	4.708	0.000	0.000	No Moderating impact	0.001	0.000	0.000	No Moderating impact

Whereas no effect of HCE on ROE for industrial companies on ASE. The control variables don't play a significant role on the impact of HCE on ROE. The current study found a negative impact of HCE on ATO. The control variables play a negative role on impact of HCE on ATO for industrial companies on "PEX and ASE". The control variables don't play a significant role on the impact of HCE on ATO. There is no any impact of HCE on EPS for industrial companies on "PEX and ASE". The control variables don't play a significant role on the impact of HCE on EPS.

Findings show that the SCE has a positive impact on EPS for industrial companies on PEX, and there is no impact of SCE on ROA, ROE, and ATO for industrial companies on "PEX and ASE". In the presence of control variables, a positive impact of SCE on ATO for industrial companies on PEX, findings are in the line with [10] who display that the company develop internal resources to increase the knowledge and innovation of their employees. Whereas, we don't find any impact of SCE on ROA, ROE, and EPS for industrial companies on PEX, and ASE. The control variables don't play a significant role on the impact of HCE on ROA, ROE, and EPS. This study support the results of [1, 4].

The research indicates that while CEE affects ATO and EPS, its effect on ROA and ROE for industrial businesses listed on PEX is not statistically significant. Conversely, for industrial companies on ASE, CEE has a positive effect on all firm performance measures. In the presence of the control variables, CEE had no effect on ROA and ROE and it had a positive impact on ATO and EPS. For industrial companies on ASE, the control variable has a negative impact on the impact of CEE on ROE. This study support the result of [3, 4]. According to [15] revealed a significant positive impact of CEE on the ATO in Italian industrial companies; because management focus on CEE to maximize their productivity.

Recommendations

- To enable investors to take an appropriate investment decision, industrial businesses on "PEX and ASE" are required to clearly disclose in their annual reports all elements of IC represented in HCE, SCE, and CEE.
- Policy makers have to be interested about developing IAS 38 to be able to measure intangible assets in adequate way.
- Managers have to realize the significant role of IC in developing the company's performance in the long—term by providing training courses for employees, rewards and promotions, improving information system, and developing the relationship with their employees and customers.
- In order to ascertain whether "intellectual capital" has the same effect on company performance, future research future research should employ the updated VAICTM model.

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The Impact of Integrated Marketing Communications on the Purchasing Behavior of Telecommunications Customers



Iyad A. A. Khanfar and Mohammad Musa

Abstract The primary objective of this research is to examine the influence of integrated marketing communications, encompassing advertising, personal selling, public relations, sales promotion, and direct marketing, on the purchasing patterns exhibited by Zain Telecommunications customers. A sample of the company's customers in Amman is selected using a simple random sampling technique. The researchers opted for a descriptive-analytical approach as it is deemed appropriate for the nature of the study. In order to ensure a satisfactory response rate, 440 individuals are provided with the study tool, resulting in the retrieval of 409 valid questionnaires for statistical analysis. The study encompasses Zain Telecommunications customers located in Amman, Jordan. The findings of the study revealed a significant impact of integrated marketing communications, inclusive of all its components, on the purchasing behavior of Zain customers. Notably, direct marketing exerts the most substantial influence, while public relations exhibits the least impact. Based on the results, the study recommends that the company allocate attention to all elements of integrated marketing communications, with particular emphasis on enhancing the public relations aspect.

Keywords Integrated marketing communications · Advertising · Personal selling · Public relations · Sales promotion · Direct marketing · Purchasing behavior · Zain telecommunications · Amman · Jordan

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1 Introduction

The concept of Integrated Marketing Communications (IMC) entails a strategic marketing approach that encompasses the comprehensive coordination and integration of diverse marketing communication elements across various communication channels, encompassing both traditional and digital platforms. The primary objective of IMC is to ensure the delivery of a consistent and all-encompassing message to the target audience, irrespective of the specific media or platforms utilized. Consequently, IMC channels facilitate the creation of a unified and interconnected communication experience for consumers, irrespective of whether they engage with physical stores, websites, social media, or mobile applications. The significance of IMC is particularly evident within the service sector at large, and more specifically, within the telecommunications sector [1].

The implementation of Integrated Marketing Communications (IMC) offers companies the opportunity to optimize their marketing budgets and achieve enhanced outcomes. Moreover, IMC facilitates greater adaptability to market dynamics and consumer trends through the swift and consistent adjustment of communication strategies [18]. The primary objective of IMC is to heighten brand awareness among target markets for products and services. Undoubtedly, IMC serves as an effective tool for professionals in developing and executing marketing communications with greater consistency and success. Despite its intangible nature within the marketing communication process, the emergence of IMC stands as a significant milestone in the advancement of the marketing field [11].

The concept of consumer behavior pertains to the various actions, decisions, and choices undertaken by individuals in the process of acquiring and utilizing products or services. This encompasses a broad spectrum of activities, such as evaluating products, selecting brands, engaging in decision-making processes, and evaluating purchases after the fact. The comprehension of consumer behavior holds significant importance for companies and marketers, as it enables them to formulate strategies that align with the requirements and preferences of their intended consumer base [14].

The necessity of efficient marketing communications in the mobile telecommunications industry is widely recognized. The telecommunications industry establishes its ways to clients through adverts among other promotional activities, majorly aimed at creating customer awareness. This chapter thus underscores the importance of effective communication with potential customers in the sector. For example, by virtue of the importance of customer satisfaction in telecoms companies, professionals are strongly advised to come up with a comprehensive marketing strategy. This comprehensive marketing strategy is to place priority on ensuring that the needs of the customer (satisfaction) are met [14].

1.1 Research Problem and Questions

The telecommunications companies are facing major obstacles in the current highly competitive business market due to fast evolving technology that changes frequently, and this is not a small industry. It greatly affects consumer behavior which has an impact on the decisions of buyers. IMC is a savior to such firms; revenue growth is never easy for any company without it given the influence that this industry has over its market position. Zain, one of Jordan's leading telecommunication players, struggles with retaining existing customers, let alone luring new ones. The objective of this study is to ascertain the actual impact of IMC elements on the purchasing decisions made by Zain's customers in Amman. These elements are designed to raise awareness about the company's products and services and attract potential customers through a range of innovative and diverse marketing strategies. However, the primary challenges lie in the effectiveness of these elements in retaining the company's current customers, attracting new ones, and generating greater profits. Consequently, this study aims to address the following key question: What is the influence of Integrated Marketing Communications elements on the purchasing decisions of Zain's customers in Amman?

1.2 Research Objectives

The primary goal of this research is to comprehensively analyze the influence of Integrated Marketing Communications components on the purchasing behavior of Zain's clientele, while concurrently striving to attain a series of subordinate objectives.

1.3 Research Hypotheses

The main hypothesis (H0) states that "there is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for Integrated Marketing Communications elements on the purchasing decision of Zain Telecommunications Company's customers in Amman." This hypothesis branches into the following sub-hypotheses:

- H01: "There is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for advertising on the purchasing decision of Zain Telecommunications Company's customers in Amman."
- H02: "There is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for public relations on the purchasing decision of Zain Telecommunications Company's customers in Amman."
- H03: "There is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for sales promotion on the purchasing decision of Zain Telecommunications Company's customers in Amman."

- H04: There is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for personal selling on the purchasing decision of Zain Telecommunications Company's customers in Amman.
- H05: "There is no statistically significant effect at the α level of significance ($\alpha \leq 0.05$) for direct marketing on the purchasing decision of Zain Telecommunications Company's customers in Amman."

1.4 Previous Studies

The impact of Integrated Marketing Communications (IMC) on purchase intention, mediated by brand equity, was found to be significantly positive in a study conducted by [16]. Furthermore, [7] discovered that consumers pay close attention to advertising in relation to their expectations, and the integration of multiple communication channels allows companies to offer consumers a more comprehensive and consistent shopping experience. In addition, the performance of insurance companies is positively influenced by advertising, sales promotion, and direct marketing, as concluded [1].

According to [12], the foundation of Integrated Marketing Communications campaigns lies in the assessment of the strengths and weaknesses of contemporary communication channels. The study conducted [4] revealed a significant and measurable influence of Integrated Marketing Communications across all dimensions on consumer purchasing decisions. In a similar vein, discovered a statistically significant impact of Integrated Marketing Communications on the attainment of competitive advantage within private Jordanian universities. Oancea [15] emphasized the interconnectedness between external stimuli, social variables, Integrated Marketing Communications, and consumer behavior. Furthermore, [8] proposed that the examination of sales promotion studies contributes to the process of consumer decision-making.

2 Methodology

The research utilized a descriptive and analytical approach, which is deemed appropriate for examining social and human phenomena, aligning with the subject matter of the study. To test hypotheses and analyze data, the study employed several statistical analysis techniques, utilizing the Statistical Package for the Social Sciences (SPSS) software for questionnaire analysis and generating results and recommendations.

2.1 Study Population and Sample

The research sample consisted of customers of Zain Telecommunications Company located in Amman. In order to achieve a satisfactory response rate, a simple random sampling method was employed. The researchers successfully obtained responses from 440 individuals, and out of those, 409 questionnaires were deemed valid and included in the subsequent statistical analysis.

3 The Results

The underlying premise of this chapter was predicated on the notion that the various components of integrated marketing communications (including advertising, public relations, sales promotion, personal selling, and direct marketing) exert a favorable influence on the purchasing patterns exhibited by Zain's clientele. In order to ascertain the validity of this assumption, a multiple regression analysis was performed to assess the aforementioned hypothesis, culminating in the subsequent findings. Table 1 presents the average ratings and standard deviations of the participants' perceptions pertaining to the elements of integrated marketing communications, organized in descending order based on the mean score.

Upon examining the average scores of the integrated marketing communication (IMC) components, it becomes apparent that the majority of dimensions performed at a moderate level. The Sales Promotion dimension garnered the highest mean score (3.82), whereas the Personal Selling dimension obtained the lowest mean score (3.49) (Table 2).

Table 1 The mean scores and standard deviations of the study's integrated marketing communications components

Paragraph	Order	Mean score	Grade
Axis 1: advertising	3	3.58	Average
Axis 2: public relations	4	3.54	Average
Axis 3: sales promotion	1	3.82	High
Axis 4: personal selling	5	3.49	Average
Axis 5: direct marketing	2	3.68	High

Table 2 Results of multiple regression analysis between independent variables

Dimension	Tolerance	VIF	Result
Advertising	0.211	1.494	No multicollinearity
Public relations	0.329	1.496	No multicollinearity
Sales promotion	0.332	1.429	No multicollinearity
Personal selling	0.499	1.411	No multicollinearity
Direct marketing	0.423	1.431	No multicollinearity

Table 3 Mean scores for advertising message content dimensions

Paragraph	Order	Mean Score	Grade
Advertising axis	3	3.58	Average
Public relations axis	4	3.54	Average
Sales promotion axis	1	3.82	High
Personal selling axis	5	3.49	Average
Direct marketing axis	2	3.68	High

It is observed that the inflation factor values for each dimension in the study are below 10, suggesting the absence of substantial multicollinearity among the independent variables. Consequently, the data is deemed suitable for analysis. Furthermore, the tolerance test results for all dimensions exceeded 0.05, indicating a lack of significant correlation between the independent variables. As a result, all dimensions can be included in the regression model to ascertain their respective statistically significant impact on the dependent variable (Table 3).

Upon analyzing the average scores of the various components of integrated marketing communication, it becomes apparent that the majority of dimensions fall within the moderate range. Among these dimensions, the Sales Promotion axis garnered the highest mean score of 3.82, while the Personal Selling axis attained the lowest mean score of 3.49.

3.1 Dependent Variable: Purchase Behavior

To answer this question, the mean scores and standard deviations of the study participants' estimates of the purchasing behavior dimension were extracted. Below are the results (Table 4).

4 Testing the Study Hypotheses

See Table 5.

The findings of the study indicate that there is a substantial degree of agreement among the participants in relation to the independent variables, with a combination of high and moderate levels observed. Furthermore, the level of agreement pertaining to the dependent variable was overwhelmingly high. The positive attitudes of the sample population towards the aforementioned statements are evident, as indicated by the arithmetic means surpassing the mean of the measurement tool.

The study's hypotheses were tested and discussed in relation to the results obtained. The study was based on the premise that the various components of integrated marketing communications, including advertising, public relations, sales promotion, personal selling, and direct marketing, have a favorable influence on

Table 4 The mean scores and standard deviations of the study participants' estimates of the purchasing behavior dimension

Purchase behavior	Mean	Standard deviation	Rank
Search for telecommunication services from multiple sources	4.05	0.88	1
Allow sufficient time to obtain the required services	3.69	0.865	9
Care about the quality of the service needed in the service search process	3.66	0.954	11
Obtain necessary information about services through family or friends	3.54	0.955	12
Will continue dealing with the company	3.8	0.934	8
Have a positive image of the services provided by the company, which prompted me to subscribe to its services	3.9	1.056	3
Continuously monitor offers at company call centers	3.92	0.953	2
Care about comparing prices of communication services from specific sources	3.82	0.878	6
Prefer to buy services from company-certified centers	3.83	0.954	5
Care about what is being discussed about the company's services	3.81	0.951	7
Review previous experiences before making a purchase	3.84	0.936	4
Prefer between the price of the service and the quality before purchasing	3.66	0.929	10

the purchasing behavior of Zain company's customers. To substantiate this assumption, a multiple regression analysis was conducted to examine the aforementioned hypothesis. The analysis yielded the following outcomes (Table 6).

The results of the multiple regression test for the main hypothesis are presented in the table above. It is evident that there is a substantial correlation, as indicated by the Pearson correlation coefficient of 0.655. Furthermore, the determination coefficient value of 0.429 suggests that the independent variables account for 38.4% of the observed variance. The calculated F value of 0.000, which is lower than the significance level of 0.05, confirms the statistical significance of the regression. Based on these findings, the following conclusions can be drawn:

- **HO1**

The impact of advertising on the purchasing behavior of Zain company's customers is deemed to be positive. Statistical analysis revealed that the t-value is significant at the 0.05 level, while the beta value of 0.332 suggests a moderate level of influence. The results imply that advertising has a positive impact on the Zain company customers' purchase behavior.

- **HO2**

There is evidence of a positive influence of public relations on Zain's customer's purchases and the findings are that the t-value is significant at 0.05 level and beta

Table 5 Arithmetic mean and standard deviation of the study variables

Factor	Source	Mean	Standard deviation	Rank	Degree
Advertising					
1. Provides sufficient information about the company's services	Alfaqih [3]	3.78	1.040	1	High
2. Generates awareness among customers about the company's services	Qawwq [17]	3.59	0.889	3	Average
3. Finds that the advertised messages published by the company are attractive	Qawwq [17]	3.51	1.128	5	Average
4. Perceives that the information published in the advertising messages by the company is motivating	Alfaqih [3]	3.36	1.107	6	Average
5. The personality used in advertising influences the customer's choice of company services	Qawwq [17]	3.51	1.074	4	Average
6. Advertising plays an important role in distinguishing the company's services	Qawwq [17]	3.73	1.011	2	High
Public relations					
7. Public relations management in the company effectively improves its mental image among its customers	Alfaqih [3]	3.71	0.963	1	High
8. The public relations department studies customer opinions about the company's services	Alfaqih [3]	3.24	0.988	5	Average
9. The company organizes events and offers discounts on religious, national, and national occasions, enhancing its relationship with customers	Alfaqih [3]	3.65	1.063	3	Average

(continued)

Table 5 (continued)

Factor	Source	Mean	Standard deviation	Rank	Degree
10. The company uses various communication methods (contests, prizes) to reach the largest possible number of customers	Alfaqih [3]	3.41	1.050	4	Average
11. The public relations department holds seminars and exhibitions to give a positive image of the company's services and attract new customers	Alfaqih [3]	3.68	0.976	2	High
Sales promotion					
12. Providing free minutes is a way to attract new customers	Al-Baba [2]	4.06	0.923	1	High
13. The company offers discounts to customers, attracting them to deal with it	Al-Baba [2]	3.73	1.080	3	High
14. Reducing the price of the service provided by the company encourages customers to deal with it	Al-Baba [2]4	3.94	1.020	2	High
15. Providing the opportunity to subscribe to competitions by the company motivates customers to deal with it	Al-Frihat []	3.68	1.053	4	High
16. Giving gifts to customers during occasions encourages dealing with the company	Al-Baba [2]	3.68	1.135	5	High
Personal selling					

(continued)

Table 5 (continued)

Factor	Source	Mean	Standard deviation	Rank	Degree
17. Sales representatives understand the needs and desires of targeted customers by the company	Qawwq [17]	3.68	1.017	1	High
18. The company has sales representatives who have the ability to convince customers	Al-Farhat [4]	3.38	1.033	4	Average
19. Sales representatives have sufficient information about the services provided by the company	Al-Baba [2]	3.6	1.067	2	Average
20. Sales representatives contribute to resolving a number of problems between customers and the company	Qawwq [17]	3.38	1.083	5	Average
21. Sales representatives in the company seek to fulfill promises	Qawwq [17]	3.34	1.064	6	Average
22. Sales representatives play an active role in building a positive mental image about the company for customers	Qawwq [17]	3.54	1.042	3	Average
Direct marketing					
23. Using email builds a relationship between the company and its customers	Al-Baba [2]	3.79	0.904	3	High
24. Brochures (catalogs) contribute to providing diverse information to the company's customers	Alfaqih [3]	3.90	0.866	2	High
25. Direct marketing contributes to increasing customer awareness of the services provided by the company	Al-Baba [2]	3.67	0.942	6	Average

(continued)

Table 5 (continued)

Factor	Source	Mean	Standard deviation	Rank	Degree
26. Customer reaction can be measured through telephone marketing towards the services provided by the company	Al-Baba [2]	3.79	0.884	4	High
27. Direct mail provides convenience and effort for the company's customers	Alfaqih [3]	3.99	0.855	1	High
28. SMS messages contribute to attracting customers' attention to the company's services	Al-Baba [2]	3.65	1.017	7	Average
Purchase behavior					
29. Search for telecommunication services from multiple sources	Qawwq [17]	4.05	0.88	1	High
30. Allow sufficient time to obtain the required services	Qawwq [17]	3.69	0.865	9	High
31. I prioritize the quality of service I need in the process of searching for a service	Qawwq [17]	3.66	0.954	11	High
32. I obtain necessary information about services through family or friends	Qawwq [17]	3.54	0.955	12	Average
33. I will continue dealing with the company	Al-Baba [2]	3.8	0.934	8	High
34. I have a positive impression of the services provided by the company, which prompted me to subscribe to its services	Alfaqih [3]	3.9	1.056	3	High
35. I continuously follow the offers at the company's call centers	Al-Baba [2]	3.92	0.953	2	High

(continued)

Table 5 (continued)

Factor	Source	Mean	Standard deviation	Rank	Degree
36. I pay attention to comparing prices of telecommunication services from specific sources	Al-Baba [2]	3.82	0.878	6	High
37. I prefer purchasing services from centers accredited by the company	Al-Farhat [3]	3.83	0.954	5	High
38. I pay attention to what is being discussed about the company's services	Qawwq [17]	3.81	0.951	7	High
39. I review previous experiences before making a purchase	Al-Farhat [3]	3.84	0.936	4	High
40. I prioritize between the price of the service and its quality before making a purchase	Qawwq [17]	3.66	0.929	10	High

value of 0.198 which means moderate impact level according to statistical analysis. The study implies that customers' buying behavior at Zain Company is positively affected by public relations: it makes sense, it contributes in a helpful way.

- **HO3**

A positive effect has been observed which is the influence of sales promotion on Zain's customer purchase behavior. Based on the statistical analysis, the t-value is significant at the 0.05 level, and the beta value being 0.433 implies an important effect size. These results point to one conclusion that sales promotion positively influences Zain customers' purchasing behavior.

- **HO4**

Positive results were discovered in the relationship between personal selling and Zain Company's customer behavior from the study. The level of confidence is high since the t-value is statistically significant at 0.05 (95%). This means that indeed there is a strong positive impact. Also, a beta value of 0.282 was found, which although not very high, shows a moderate effect; thus, confirming that personal selling has a positive influence on Zain company's customer behavior.

- **HO5**

The influence of direct marketing on Zain Company's customers observed purchasing behaviour is seen as a positive one. In statistics analysis, it appears that the t-value is significant at the 0.05 level and the beta value of 0.507 reflects a considerable amount

Table 6 Results of the main hypothesis test

Dependent variable	Model summary				Digital marketing techniques	Standard deviation coefficients		Standard coefficients	(T) calculated	T. Sig
	R	R^2	F calculated	DF		Standardized coefficients (B)	Standard error	Beta coefficient β		
Purchasing behaviour	0.655	0.655	54.00	1	Advertising	0.123	0.022	0.364	6.375	0.000
				208	Public relations	− 0.046	0.331	0.051	0.977	0.329
				209	Sales promotion	0.223	0.0245	0.384	6.562	0.000
					Personal selling	0.099	0.0129	0.065	1.055	0.291
					Direct marketing	0.294	0.113	0.401	7.011	0.000

Significant at ($0.05 \geq \alpha$) level

of impact. Based on these results, we can confidently state that the effect of direct marketing on Zain company's customers' purchasing behaviour is positive.

Consequently, the hypothesis positing a favorable impact of integrated marketing communications components on the purchasing behavior of Zain company's clientele is deemed valid.

5 The Results

The findings of the study revealed a significant level of interest among the participants regarding the impact of integrated marketing communication components on the purchasing behavior of Zain's telecommunications service customers. The overall average score of 3.62 indicated a moderate level of relative importance. The dimensions of the integrated marketing communication elements exhibited varying scores, ranging from moderate to high, based on the responses of the participants. Among the various elements, sales promotion garnered the highest impact score, with an average score of 3.82. The results showed that advertising and public relations had moderate relative importance with scores of 3.58 and 3.54, respectively. On the other hand, direct marketing was rated at an average score of 3.68 while personal selling emerged as the least influential component with a score of 3.49. The findings indicate that Zain is successful in using integrated marketing communication elements although there was differing perception within the sample as shown by the varying average scores. This suggests some level of discord but still implies broad approval for their strategies at different levels among consumers reached by these different approaches (advertising, PR or DM).

The results of this investigation coalesce with Ben Melloud's research in 2024, establishing that the amalgamation of various communication channels can forge a more thorough and uniform shopping expedition for customers. In addition, our findings find camaraderie with Al-Freihat's study in 2015 that unearthed a significantly impactful integrated marketing communications. Similarly, our work echoes Al-Faqih's analysis in 2015 affirming the constructive impact that an integrated marketing communications mix has on securing competitive edge. Finally, we end by anchoring our findings to those brought forth by. It documented an unequivocally significant relationship between advertising and its efficacy at swaying buying behaviors.

Moreover, the current study was in line with the findings of [9], who demonstrated the influence of sales promotion programs on consumer behavior. Additionally, the study supported the conclusions of [1], who found that advertising, sales promotion, and direct marketing have a positive impact on the performance of insurance companies. Furthermore, the findings were consistent with [16] research, which showed that integrated marketing communications significantly enhance purchase intention through the mediating role of brand equity.

In contrast, the findings of this study deviated from [2] research, which ranked public relations as the second most influential factor on purchasing behavior. Furthermore, it contradicted Baba's study in terms of the perceived impact of advertising, which was considered the least influential dimension of integrated marketing communication. These findings also diverged from, which demonstrated a significant influence of public relations in attaining competitive advantage for private Jordanian universities. Moreover, they differed from the findings of [6], which indicated that consumers closely follow advertising with regards to their expectations.

5.1 Recommendations

In order to effectively engage with customer interests, Zain should prioritize the utilization of integrated marketing communication elements and stay updated on new activities related to tracking these elements. It is recommended that the company's management devise a comprehensive plan to enhance the performance of public relations, ensuring effective communication with a wide customer base. To better understand the reasons behind the limited impact of public relations on purchasing behavior, conducting scientific research and seeking the expertise of marketing professionals, academics, and experienced individuals is crucial. Additionally, it is important to place greater emphasis on advertising, as customer opinions regarding its role in motivating purchases may vary. Therefore, it is essential to ensure that advertising messages targeted towards customers have the ability to stimulate purchasing decisions. Furthermore, focusing on personal selling in sales centers and locations where direct communication between customers and sales representatives takes place is recommended. This can be achieved by increasing the allocation of free minutes, offering discounts on service prices, and providing gifts to customers. Lastly, it is advisable to continuously diversify the use of integrated marketing communication elements when engaging with customers.

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The Effect of Deferred Tax Assets and Tax Planning on Earnings Management: Evidence from a Stock Exchange



Munia O. Abu Hammad and Mohammad H. Abu-Nassar

Abstract The study analyzed the effect of deferred tax assets and tax planning on earnings management. The sample consisted of 34 industrial firms and 38 service firms from the Amman Stock Exchange with complete data entries between 2010 and 2022. Multiple regression is employed to test two hypotheses. Panel cross-sectional data is used to predict the effect of deferred tax assets and tax planning on earnings management. The study revealed that Jordanian services and industrial firms are on average likely to engage in some sort of earnings management. In addition, the Pearson correlation tests showed that tax planning and other control variables (size, leverage, and return on assets) had significant relationships with earnings management. The regression results indicated that there was no significant effect of deferred tax assets and tax planning on earnings management, thus the null hypothesis is accepted and the alternative hypothesis is rejected. Return on assets (ROA) was a statistically significant factor in the regression model. Based on the findings, the study recommends that close governmental monitoring be required to limit the practice of earnings management.

Keywords Deferred tax assets · Tax planning · Earnings management · Amman stock exchange

1 Introduction

Financial statements are important means to evaluate the performance of businesses, they are an indicator required by company management to assess the effectiveness of the company's performance, it is particularly important as it reports net income of the

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business. Net income which is the amount of money a corporation has earned after subtracting all of its expenses is essential to determine if the company was profitable in a certain period of time [33]. Managers sometimes tend to manipulate net income in order to display good company performance. Although this is true at first glance, more profits will bring about heavy tax burden. Governments aim to attain as much tax revenues as they can, while corporate tax payers will always seek to reduce their tax bill as it will eventually affect their profits. Businesses minimize tax burden, by conducting tax planning, which is a part of earnings management [4, 8, 13].The manipulations of earnings value, which is performed by managers, is difficult to detect by financial statements users. Accordingly, financial statement users should have an awareness and knowledge of the various indicators that can predict earnings because there could be a risk of misleading financial statements [32].

Healy and Wahlen (1999) defined earnings management as a manipulation made by management in preparing the financial statements to its judgment and rearranging transactions to alter accounting reports to either deceive stakeholders about the company's underlying financial condition or have a significant impact on the contractual results that depend on accounting results. Upon employing earnings management, several conditions will arise to which the management will be confronted wherein there is a rise in profit reflecting well on the company's performance. However, this may be associated with increases in income tax as well. While the government, particularly the tax revenue department, anticipates increased income in correlation with income tax, the business sector aims to minimize its corporate tax burden by what is called tax planning [17, 26].

Some factors play an important role as predictors of earnings management in addition to tax planning. These predictors include: discretionary accruals, leverage¸ size of the company, and deferred tax assets [7, 10, 21, 33]. The latter factor can be defined as the amount of income tax that can be recovered in the period to follow. Its value should be monitored at the conclusion of each reporting period, in order to enable the management to revise and assess a new value for deferred tax assets, being a subjective procedure [29]. When accounting income is lower than taxable income this results in temporary variations, causing deferred tax assets to occur. As a result, the corporation will be able to defer the payment of the tax until a later date. Also differences between the Financial Accounting Standards (FAS) and the terms of the Taxation Regulations result in deferred tax. In general, there is a distinction between bookkeeping-based income and taxable income [20].

Tax planning is related to the manipulation process that businesses undertake in order to lower tax debt, without jeopardizing tax regulations. Tax planning can be described as the full, accurate, and timely fulfillment of tax obligations in order to minimize resource waste [13, 21]. Tax planning applies to the tax burden minimization process, but does not breach the tax regulations in place [17]. It is one of the functions of tax management that is used to assess the amount of tax to be paid and what can be done to escape taxes [30].

Meidiawati and Mildawati [14] explained many ways of minimizing tax burden by taxpayers:

1. Tax shifting: is transfer of tax burden from taxpayers to other parties.
2. Capitalization: is reduction in the taxable object price and make it equivalent to the amount of tax that will be charged later on by the buyer.
3. Transformation: is a form of tax evasion in which a company covers the tax burden that has been put on it.
4. Tax evasion: is avoidance of taxes that is performed on purpose by violating the existing tax laws by taxpayers.
5. Tax avoidance: is taxpayer's attempt to minimize their tax burden by using real alternatives that are acceptable to the tax authorities.

The purpose of this study is to investigate the effect of deferred tax assets and tax planning on earnings management. Initially, the underlying assumption of the study is based on the earnings management hypothesis which expects an inverse relationship between earnings management and deferred tax assets. Tax planning is also linked to earnings management and is expected to demonstrate similar relationship with deferred tax assets. Consistent with the previous literature, the study takes into consideration a set of control variables which are ROA, size and leverage. The study is conducted in the Jordanian context.

This study aims to investigate the effect of deferred tax and assets tax planning on earnings management. This effect has been studied in countries outside Jordan with different tax systems. The research will shed a light on the effect of deferred tax assets and tax planning on earnings management in Jordan, according to the Jordanian tax system. It will add value to auditors, income tax department and company's management.

2 Literature Review and Hypothesis Development

Managers strive to increase the recorded earnings in order to show the success of the company and receive bonus payments such as remunerations [1]. However, earnings management behavior is not just the fault of management, since the Financial Accounting Principle (IFRSs) enables management to choose from a variety of alternatives of accounting in preparing financial statements (Robert Jao and Gagaring Pagalung 2011). Earnings management has been a subject of study for decades, with some studies looking into the factors that influence it, others looking into how it could be detected, and even others looking into the variables that might impact earnings management. Earnings management can be characterized as management's manipulation of financial statements based on its discretion and reorganizing activities to change financial report in order to mislead stakeholders about the firm's total financial condition or have a significant effect on contractual results that rely on accounting results [21, 23].

2.1 Deferred Tax Assets and Earnings Management

There are two major forms of earnings management, these forms are: (1) Real earnings management which is characterized as management activities that deviate from standard business practices with the primary goal of exceeding predetermined earnings targets. (2) Accrual earnings management that aims to obscure true economic performance by changing accounting methods or estimates within the generally accepted accounting principles. The assumption in the literature on earnings management is that managers use discretion to raise book-income (before taxes) without raising taxable income [16] to get the benefit of effectively reporting higher book income without paying further taxes in the same time. Hence, a high deferred tax expense (DTE) indicates a larger gap between book and taxable income. This means that earnings management is more likely to avoid reporting an earnings loss in smoothing reported profits.

Temporary differences between book and taxable income are described as differences between book and tax income that can be reversed in subsequent time. Permanent differences are characterized as differences between book income and tax income that cannot be reversed in subsequent period. Deferred tax liabilities and deferred tax assets are the result of temporary variations. According to Suranggane [29] "Deferred tax assets occur when accounting income is smaller than taxable income due to temporary differences". This happens when a corporation is willing to defer the payment of tax until later period. Deferred tax assets are generated when the amount of tax has either been paid or has been carried forward, but it's not yet been reported in the income statement. The real value of deferred tax asset is estimated by comparing the book income to taxable income [8]. The Deferred tax asset (DTA) is generally applied to cases in which a company has either overpaid taxes, pays taxes in advance, or has losses that have been carried over. In practice, by tax loss carry-forwards, accounting and tax losses can be used to protect potential profits from taxes.

Sumomba and Hutomo [28] worked on the effect of deferred tax assets and tax planning on the management of earnings for non-financial companies listed in Indonesia Stock Exchange. Their results show a significant positive effect of deferred tax assets on earnings management. This implies that deferred tax assets are relevant for predicting earnings management. In addition, Warsono [31] investigated how deferred tax assets, deferred tax burden, and tax planning could influence earnings management. The result showed that deferred Tax Assets were significantly and positively correlated with earnings management.

In contrast, Widiatmoko and Mayangsari [32] evaluated the influence of deferred tax asset, on earnings management. Manufacturing companies listed on the Indonesia Stock Exchange from 2011 to 2013 were the study's focus. The study concluded that earnings management was insignificantly correlated with deferred tax assets. Moreover, Rachmany and Tajudin [21] analyze the effect of deferred tax expense on earnings management, and found that deferred tax expense has no significant effect

on earnings management. Due to the contradictory effect of deferred tax assets on earnings management, the first hypothesis is stated as follows:

H1 Deferred tax assets is significantly affect the earnings management.

2.2 Tax Planning and Earnings Management

Midiastuty et al. [15] defined tax planning as "the process of minimizing tax debt but still within the framework of applicable tax regulations". In general, tax planning refers to the reverse process and transaction by which a company's tax debt is reduced to a minimum amount, while remaining within the confines of tax regulations. It's related to the business and transaction manipulations made by the taxpayer. It's used to keep tax debt at minimal amounts, but it's still within taxation regulations. Tax planning, on the other hand, can further be used and explained as planning for fulfillment of tax obligations correctly, completely, and in a punctual way so as to mitigate resources wasting in the most efficient possible way [21]. When tax planning is conducted in this way, it will enable managers to reduce the value of earnings and hence reduce the company's tax amount. Tax planning is carried out by maximizing benefits, minimizing actual taxes, minimizing actual profit and maximizing expenses so that tax is imposed to the bare minimum [24].

Companies must understand tax regulations in order to implement tax planning that does not violate these regulations. There are several strategies for regulating corporate accounting and finances in order to reduce tax liabilities:

a. Tax saving: Tax saving is trying to reduce the tax burden by using a low rate alternative tax.
b. Tax avoidance: Tax avoidance is an attempt to reduce the tax burden by avoiding taxes by steering transactions that are not tax, such as directing transactions to relatively large losses in the previous period.
c. Tax delay: Deferrung of tax payments without breaking the law and violating applicable regulations by postponing the issuance of tax invoices until the time limit allowed, such as credit sales [25].

The relationship between tax planning and earnings management is expected to be positive. This is due to the motivation of management to pay the least amount of taxes, which in turn will encourage management to engage in the practice of earnings management through tax planning. Bunaca and Nurdayadi argued that tax planning is positively correlated with earnings management, implying that the more tax planning, the more likely it is for businesses to run earnings management. This is in line with research carried out by Basalat et al. [3], Warsono [31], Dyah Safitri et al. [6] and Mulatsih et al. [17] concluded that the correlation between tax planning and earnings management is positive and substantial particularly in companies that experience profits (profit companies). Nonetheless, Aditama and Purwaningsih (2016), Mulyani et al. [18], and Mulyati et al. [19] showed that there was no significant impact of tax

planning on the practices of earnings management. Based on the literature and the results of previous studies, the second hypothesis is stated as follows:

H2 Tax planning significantly affects earnings management.

3 Study Design and Methodology

In order to fulfill study objectives, the effect of deferred tax assets and tax planning on earnings management is examined as follow (Fig. 1)

3.1 Study Model

In order to achieve the study objectives, the study used the following model. Size, leverage and return on assets were used as control variables.

$$\mathrm{REM}_{it} = \alpha + \beta 1\mathrm{DTA}_{it} + \beta 2\mathrm{TP}_{it} + \beta 3\ \mathrm{SIZE}_{it} + \beta 4\ \mathrm{LEV}_{it} + \beta 5\ \mathrm{ROA}_{it} + \mathrm{e}_{it} \quad (1)$$

where

REM Dependent variable that represents real earnings management measured the abnormal operations and production costs (Roychowdhury 2006).

DTA Independent variable that represents deferred tax assets is measured by the change in the value of deferred tax assets at the end of period t with t − 1 divided by the value of deferred tax assets at the end of t − 1 [8, 26].

TP Independent variable that represents tax planning is measured by tax retention rate: net income divided by pretax income [8, 12].

SIZE Control variable that represents firm size measured by the logarithm of total asset.

LEV Control variable that represents leverage measured by dividing total long-term debt on total assets.

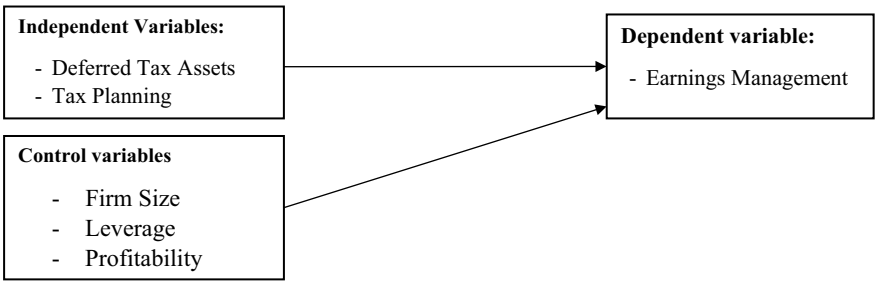


Fig. 1 Conceptual model of the study

ROA Control variable that represents profitability measured by dividing net profit on total assets.
i firm.
t year.
α the constant in the regression model.
β1–β5 Regression coefficient.

Real earnings management is characterized as management activities that deviate from standard business practices with the primary goal of exceeding predetermined earnings targets.

Three real earnings manipulation approaches are considered in measuring REM (Roychowdhury 2006):

1. abnormal cash flows from operations
2. abnormal discretionary expenses, and
3. abnormal production costs

According to Zang (2012) we are going to concentrate on abnormal discretionary expenses and abnormal production costs in our primary tests. Abnormal cash flows from operations are only considered as a robustness test, because Roychowdhury (2006) argued that cash flows from operations are influenced by manipulations of real activities in different directions, making the net effect unclear. The following equations was used in estimating the normal level of discretionary expenses and production costs for each company and year, which are conducted by Zang (2012):

$$\frac{DISXt}{At-1} = \mathrm{K0} + \mathrm{K1}\frac{1}{At-1} + K2\frac{SALESt}{At-1} + \varepsilon t$$

$$\frac{PRODt}{At-1} = \mathrm{K0} + \mathrm{K1}\frac{1}{At-1} + K2\frac{SALESt}{At-1} + K3\frac{\Delta SALESt}{At-1} + K4\frac{\boldsymbol{\Delta} SALESt-1}{At-1} + \varepsilon t$$

$\boldsymbol{DISX_t}$ refers to the discretionary expenses in year t, it represents the sum of advertising expenses, R&D expenses and Selling, and General and Administrative Expenses (SGA).

$\boldsymbol{PROD_t}$ refers to the production costs in year t, it represents the sum of costs of goods sold (COGS) and the change in inventories.

$\boldsymbol{A_{t-1}}$ is total assets.

$\boldsymbol{SALE_t}$, $\boldsymbol{\Delta SALE_t}$ and $\boldsymbol{\Delta SALE_{t-1}}$ mean the level, the change and the lagged change of gross sales from ordinary operations.

The abnormal discretionary expenses (*ADISX*) and abnormal production costs (*APROD*) are computed as the industry-year residuals from the above regression equations. Given sales levels, earnings are managed upward through abnormally low discretionary expenses and/or abnormally high production costs.

We calculate discretionary accruals as the difference between the accounting accruals scaled by lagged assets and the sum of the first four components on the right hand side of Eq. (3):

$$\frac{\text{ACCRUAL}t}{At-1} = \text{K0} + \text{K1}\frac{1}{At-1} + K2\frac{\Delta SALESt - \Delta RECt}{At-1} + K3\frac{PPEt}{At-1} + \varepsilon t$$

ACCRUALt represents earnings before extraordinary items and discontinued operations minus operating cash flows reported in the statement of cash flows for a certain year; A_{t-1} is the lagged total assets; DSALESt is the change of sales; DRECt is the change in accounts receivables; and PPEt is the gross property, plant, and equipment.

Size: is the logarithm of total asset of the firm. Dewi and Fenny (2011) concluded that the size of the company has significant and positive effect on earnings management.

Leverage: is the percentage of total long-term debt scaled by total assets. Dewi and Fenny (2011) found that the leverage has a significant positive effect on earnings management.

ROA: Return on assets, it is the percentage of net profit scaled by total assets.

3.2 Study Sample and Population

Sample of the study includes 72 industrial and services firms. The sample contained 34 industrial sector firms and 38 services sector firms listed on the Amman Stock Exchange which have complete data entries from 2010 to 2022.

4 Results, Discussion, and Conclusion

This section presents the experimental results of the study, followed by discussion and conclusion.

4.1 Descriptive Statistics

Table 1 shows that the mean value of Earnings Management (EM) was 0.198. The minimum value was − 0.19 while the maximum value was 0.60 and standard deviation (SD) was 0.153. The mean value of EM is above 0 (0.192) indicating that Jordanian services and industrial sectors are on average likely to engage in some sort of real earnings management. Standard deviations show exceptionally high values

Table 1 Descriptive statistics

	Minimum	Maximum	Mean	Std. deviation
Earnings management	− 0.19	0.60	0.198	0.153
Tax planning	− 2.29	7.83	0.898	0.871
Deferred tax assets	− 0.93	7.90	0.411	0.453
Size	5.66	9.25	7.469	0.647
Leverage	0.00	0.98	0.376	0.253
Return on assets	− 0.52	0.36	0.004	0.090

that is nearly the value of the mean. This means that values of earning management are highly variable for different companies and do not show a specific pattern.

Tax planning is the first independent variable in the model; measured by dividing net income by pretax income, has an average of 0. 898, a minimum of − 2.29, a maximum of 7.83, while (SD) was 0.871, much larger than the mean indicating highly variable values of tax planning.

The second independent variable is Deferred Tax Assets and was measured by the change in the value of deferred tax assets at the cessation of current period divided by the value of deferred tax assets at the end of pervious period t − 1. The average of Deferred Tax Assets was 0.411, the minimum was − 0.93 and the maximum was 7.90 with a standard deviation of 0.453, which is much larger than the mean and also indicating high variability of the values of deferred tax assets.

In this study there are three control variables: size, leverage and ROA. And the description of these variables is included in Table 1.

4.2 Pearson Correlation Matrix

Table 2 shows correlation analysis using Pearson's correlation coefficient. It is evident from Table 2 that tax planning has significant positive relationship with earnings management (R = 0.079 and sig. = 0.035). The positive relationship between tax planning and earnings management means that when tax planning increases, earnings management also increases and vice versa. These findings confirm arguments that management is motivated to pay the least amount of taxes, which in turn will encourage management to engage in the practice of earnings management through tax planning. The results are consistent with previous studies by Subagyo and Oktavia (2010), Warsono [31], Dyah Safitri et al. [6] and Mulatsih et al. [17].

Table 2 also shows significant correlations between ROA and Leverage and earnings management. The strongest correlation is with ROA followed by leverage. ROA and Leverage have significant correlations with EM, indicating that when ROA increases and Leverage decreases, managers are more likely to practice EM. In Addition, correlation of Earnings Management with Deferred Tax Assets is insignificant, indicating that when there is no correlation between Deferred Tax Assets and earnings management.

Table 2 Pearson correlation analysis

		EM	Tax planning	DTA	Size	Leverage	ROA
EM	Pearson correlation	1					
	Sig						
Tax planning	Pearson correlation	0.079*	1				
	Sig	0.035					
DTA	Pearson Correlation	0.058	− 0.069	1			
	Sig	0.122	0.064				
Size	Pearson correlation	− 0.044	− 0.048	− 0.066	1		
	Sig	0.241	0.196	0.077			
Lev	Pearson correlation	− 0.145**	− 0.026	− 0.063	0.420**	1	
	Sig	0.000	0.486	0.093	0.000		
ROA	Pearson correlation	0.207**	− 0.102**	0.017	0.219**	− 0.307**	1
	Sig	0.000	0.006	0.645	0.000	0.000	

* Correlation is significant at the 0.005 level
** Correlation is significant at the 0.01 level (2-tailed)

4.3 Regression Analysis and the Testing of the Hypotheses

The objective and the main aim is to examine the effect of the independent variables (deferred tax assets and tax planning) on earnings management which is the dependent variable, controlled by: leverage ratio, ROA (return on assets) and firm size. In this section, Table 3 illustrates the results of the regression model. The F value is 7.655 and the model is highly significant at $P < 0.001$. The result indicates that the study model has an explanatory power ($R^2 = 0.052$), however, all variables were not significant predictors for earnings management except for (ROA). Thus, null hypothesis (which states there is no effect of deferred tax assets and tax planning on earnings management) is accepted and the alternative hypothesis is rejected. The results show that ROA has a significant effect on earnings management of companies of both sectors. Whereas DTA, Tax planning and other control variables do no show significant effect on EM. The value of Adjusted R^2 , as presented in table 3, is 4.5% of variation in the earnings management can be explained by the model.

Table 3 shows that the highest contribution to the model is that of ROA that shows a B weight of 0.369, followed by leverage with − 0.028 (inversely proportional to EM). However, ROA is the only variable with significant contribution to the regression model ($P < 0.001$).

Table 3 Pooled linear regression results/dependent variable: earnings management

R square	0.052					
Adjusted R square	0.045					
F	7.655					
Sig	0.000					
Model	Unstandardized coefficients		Standardized coefficients	t	Sig	VIF
	B	Std. error	Beta			
Constant	0.311	0.070		4.464	0.000	
Tax planning	− 0.001	0.005	− 0.008	− 0.233	0.816	1.018
Deferred tax assets	− 0.001	0.006	− 0.006	− 0.169	0.866	1.011
Size	− 0.015	0.010	− 0.063	− 1.469	0.142	1.467
Leverage	− 0.028	0.028	− 0.043	− 0.984	0.326	1.542
Return on assets	0.369	0.071	0.217	5.195	0.000	1.347

The last column in the table display collinearity statistics (tolerance and VIF) to assess the level of multicollinearity between variables. The results of collinearity statistics tests, with VIF values around 1 indicate that there is no multicollinearity problem in the model of the study.

Nonetheless, Aditama and Purwaningsih (2016), Mulyani et al. [18], and Mulyati et al. [19] examined the effect of tax planning, deferred tax asset, and deferred tax expense on earnings management. They discovered that tax planning, deferred tax asset, and deferred tax expense have no influence on the EM. Their findings were similar and consistent with the findings of this study. While Widiatmoko and Mayangsari [32] studied effect of: leverage, company size, tax planning, deferred tax asset and discretionary accruals on EM. Other researchers had an opposite findings. Subagyo and Oktavia (2010), Warsono [31], Dyah Safitri et al. [6] and Mulatsih et al. [17] investigated the effect of deferred tax assets, and tax planning on earnings management and found significant effect on earnings management.

5 Conclusion

This study has investigated the effect of deferred tax assets and tax planning on EM. Earnings management is considered a dependent variable. Deferred tax assets and tax planning are considered independent variables. For comparison purposes, the effect of other factors that affect earnings management were used as three control variables during regression analysis which are: firm size, profitability (ROA) and

leverage. The study included a sample of 72 industrial and services companies listed in Amman Stock Exchange from 2010 to 2022.

Results indicated that: tax planning and deferred tax assets were not significant predictor (independent) variables for EM. However, ROA as a control variable have shown a significant positive relationship with earnings management. Thus our results support the hypothesis that tax planning and deferred tax assets have no significant impact on earnings management as revealed by industrial and services firms listed on Amman Stock Exchange. These findings have profound implications for companies seeking to strengthen their corporate governance frameworks and improve their tax strategies, ultimately leading to increased firm value and competitiveness in the Jordanian market. This study asserts that tax planning and deferred tax assets have no significant relationship with earnings management for combined sectors. Moreover, the study provides evidence from an emerging market based on a sample of non-financial firms.

There are some limitations to this study: the small size of the study sample and the limitation of the sample to industrial and service companies, and therefore it may be difficult to generalize the results of the study to the rest of the sectors in Jordan.

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The Impact of Financial Technology on Inventory Management Efficiency



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Abstract The present study aims to investigate the way that inventory management can be revolutionized by FinTech—specifically, once again, the blockchain. FinTech innovations, such as blockchain, data analytics, and AI, provide an opportunity to make traditional inventory management more up-to-date. Since good inventory management is essential to a successful and efficient supply chain, financial cost reduction, and meeting customer needs, we will review the current state of the field. As well as how blockchain technology allows for improvements in the transparency, traceability, and security of our supply chains. This paper uses detailed empirical methods to examine the impact of FinTech adoption on a variety of important inventory management metrics in increasingly realistic settings, such as holding costs and turnover rates, in many businesses. Our results highlight important cost, stockout, and turnover rate reductions for firms utilizing predictive analytics combined with automated tracking systems, with significant implications for businesses looking to improve operations in their supply chain and derive competitive advantage from technological innovation, finding support for the empirical adoption of FinTech solutions in inventory management operations.

Keywords FinTech · Supply chain · Blockchain · Finance

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1 Introduction

Financial Technology (FinTech) has transformed the business landscape by overhauling legacy systems and financial controls in every sector of the industry. Its application in supply chains has puzzled many because it promises an increase in productivity and reduction in costs. With that in mind, understanding the effects of FinTech on inventory management efficiency is important for those looking to streamline their business processes.

FinTech [1] stands for "financial technology" and describes financial technologies that innovate and provide financial services through technological advances. In other words, FinTech transforms the financial processes we've known for decades from conventional paper-based processes to digital financial solutions. When it comes to inventory management, FinTech solutions are technologies such as blockchain, data analytics, artificial intelligence, and many more that help you better control, track, analyze, and optimize the level of inventory.

The Supply Chain [2], which includes all of the interconnected stakeholders involved in the processes of creating, distributing and delivering a product or service, is the backbone of any business. Reacting to customer demand in a timely and cost-effective way is crucial. Inventory management is the art of maintaining optimal inventory levels globally, while ensuring that production schedules work. You can see how technology can support inventory management, and FinTech is just one of those "digital" innovations that have started to influence the way that companies manage their inventories.

Although blockchain is a distributed ledger system developed to ensure secure financial exchanges of cryptocurrencies, it has gained significant attention for potential applications outside the financial sector [3]. Blockchain is a decentralized, secure, and irreversible record-keeping system that improves transparency, traceability, and overall security throughout the supply chain [4]. Blockchain-based technology has the potential to improve inventory management efficiency by minimizing errors, preventing fraud and theft cases, and increasing overall visibility. Real-time monitoring of item movements enhanced by blockchain technology may also increase inventory visibility.

Despite of there is an increasing amount of literature discussing the potential impacts of FinTech on improving supply chain and inventory management efficiency, there are several gaps in the current literature. First, empirical studies that measure the real-time effects of FinTech adoption on inventory management metrics are few. The existing papers mainly discuss different conceptual frames and hence, rarely provide evidence for their claims. So, there is an inadequate level of empirical evidence to enable the decision-making process for organizations either contemplating adopting FinTech for inventory management or already using it. Second, the literature also finds that data privacy, interoperability and regulatory compliance are issues that may curb widespread adoption of FinTech solutions for inventory management. Therefore, what is required are checklists, rules of thumb and best practices for companies that aim to successfully implement FinTech inventory management solutions. Third,

the literature argues that future exploration of the role of FinTech in inventory and supply chain management should not solely rely on either practitioners and managers or on researchers who have various levels and directions of interaction with these professionals but also account for the views of those in government, policymakers, consumers, and technologies.

These views have rarely been intersected and integrated with the realm of technology in inventory management in supply chains, which is fundamental to providing a holistic approach to address the potential concerns that arise from the use of FinTech in the field. Therefore, addressing these aspects and their potential concern with the appropriateness of FinTech applications to inventory management within the supply chain is key to developing an organized framework that can enable managers and researchers to harness the potential of FinTech towards driving efficiency and competitiveness.

2 Literature Review

The integration of financial technology (FinTech) into supply chain operations has emerged as a focal point in contemporary business discourse, with particular emphasis on its potential to enhance efficiency in inventory management. FinTech encompasses a range of innovative technologies, including blockchain, data analytics, and artificial intelligence, each offering unique opportunities for transforming traditional inventory management practices.

Blockchain technology, initially developed as the underlying infrastructure for cryptocurrencies like Bitcoin, has garnered significant attention for its applicability in supply chain management. Tapscott and Tapscott [5] assert that blockchain's decentralized ledger system ensures transparency and immutability of transaction records, thereby enhancing trust and accountability among supply chain participants. By providing a secure and tamper-proof record of transactions, blockchain facilitates end-to-end visibility into the movement of goods, enabling stakeholders to track products from their point of origin to final destination [6]. This transparency not only reduces the risk of errors and fraud but also enables faster dispute resolution and regulatory compliance.

Furthermore, FinTech solutions offer advanced analytics capabilities that enable businesses to leverage data-driven insights for more effective inventory management. Predictive analytics, in particular, allow organizations to forecast demand with greater accuracy, optimize inventory levels, and minimize stockouts [7]. By analyzing historical sales data, market trends, and other relevant variables, predictive analytics models can anticipate fluctuations in demand and adjust inventory levels accordingly, thereby reducing carrying costs and improving operational efficiency.

In addition to predictive analytics, automated inventory tracking systems play a crucial role in enhancing inventory management efficiency. Leveraging technologies such as Radio Frequency Identification (RFID) and the Internet of Things (IoT), these systems provide real-time visibility into the movement and status of inventory

throughout the supply chain [8, 9]. By automatically capturing data on inventory levels, location, and condition, these systems enable organizations to monitor inventory in transit, identify bottlenecks or delays, and proactively address supply chain disruptions.

Despite the potential benefits of FinTech in inventory management, several challenges and barriers to adoption persist. One such challenge is the issue of data privacy and security, particularly concerning the sharing of sensitive information across multiple parties in a blockchain network [10]. Additionally, interoperability and standardization remain significant hurdles, as different FinTech solutions may use incompatible protocols or formats, hindering seamless integration into existing supply chain systems [11].

Many gaps are indicated by the literature examining supply chain inventory management and financial technology, or FinTech. Studies that assess the real-time effects of fintech on inventory management across sectors and industries are few and far between. Although a number of theoretical models and conceptual frameworks have been employed, there is disagreement over the best paradigm for integrating FinTech into inventory management. In summary, there are still studies lacking that focus on the difficulties and barriers facing fintech, such as those involving compatibility problems and sensitive data. The extant research extols the potential advantages of FinTech in enhancing supply chain and inventory management efficiency.

The majority of FinTech innovations that have been discussed in the literature, like blockchain, speed up product traceability and transparency throughout the supply chain. They also make it possible to predict product demand going forward, which helps to maintain optimal inventory levels throughout the supply chain. Because of the elimination of overstocks and stock outs as well as cost reductions across the supply chain, it would become more efficient and increase customer satisfaction. This is in line with what we anticipate from fintech.

But there is still a long way to go before these promises are realized, in part because of sensitive data protection considerations [12]. A further obstacle in this road is the need to standardize various systems within a supply chain [13]. In addition to assisting practitioners in understanding the advantages of this initial step of fusing inventory management with FinTech, ongoing research in this field will be helpful to researchers who may expand on their investigation and discover more statistically significant results in this area.

3 The Methodology

The methodology for this research involved conducting a comprehensive review of academic journals and literature from reputable sources, focusing on the integration of financial technology (FinTech) in inventory management within supply chains. We utilized relevant keywords to search for studies over the past decade, encompassing topics such as “FinTech,” “inventory management,” “supply chain,” “blockchain,” “data analytics,” and “artificial intelligence.”

Our approach prioritized peer-reviewed articles and scholarly sources to ensure the reliability and rigor of the reviewed literature. Each article's methodology, data collection, analysis, and result quality were evaluated to determine its relevance and contribution to the study.

Content analysis was employed to identify recurring topics and themes across the synthesized data and results, aiding in drawing meaningful conclusions.

The review aimed to provide a broad perspective on the role of FinTech in enhancing inventory management effectiveness and to stimulate further research in this area. Through this methodology, we aimed to establish a robust foundation for our study's findings.

4 The Proposed Developments

Addressing the identified gaps in the literature concerning the integration of financial technology (FinTech) into inventory management within supply chains requires a multifaceted approach aimed at conducting empirical research, developing best practices, overcoming implementation challenges, fostering interdisciplinary collaboration, and promoting continuous learning and adaptation.

4.1 Conducting Empirical Studies

Conducting comprehensive empirical studies is paramount to gaining a nuanced understanding of the real-world impact of FinTech adoption on inventory management metrics across diverse industries and organizational contexts. These studies should employ rigorous methodologies, including longitudinal analyses and control groups, to provide robust evidence of the effectiveness of FinTech solutions in improving inventory management efficiency [13]. By collecting empirical data and analyzing key performance indicators such as turnover rates, holding costs, and stockouts, researchers can assess the tangible benefits of FinTech adoption and identify areas for further improvement.

However, there are some pros and cons for this, which can be addressed as follows:

Pros:

1. Provides robust evidence of the effectiveness of FinTech solutions in improving inventory management efficiency.
2. Offers insights into the specific impact of FinTech adoption on key performance indicators across diverse industries and contexts.
3. Informs evidence-based decision-making for organizations considering or already implementing FinTech solutions in their inventory management practices.

Cons:

1. Requires significant time, resources, and expertise to design and conduct rigorous empirical studies.
2. May face challenges in obtaining access to proprietary data or securing cooperation from industry stakeholders.
3. Findings may be influenced by confounding variables or external factors beyond the researchers' control, leading to potential biases or limitations in generalizability.

4.2 Developing Best Practices

Developing best practices and guidelines for implementing FinTech solutions in inventory management practices is essential to facilitate successful adoption and integration. Collaboration between scholars and practitioners can be instrumental in this regard, leveraging case studies, benchmarking exercises, and knowledge-sharing platforms to identify common success factors, challenges, and lessons learned from FinTech adoption initiatives [14]. By synthesizing insights from academic research and industry expertise, stakeholders can develop actionable recommendations and frameworks to guide organizations in effectively leveraging FinTech innovations to optimize their inventory management processes. The pros and cons for these points can be summarize as:

Pros:

1. Facilitates knowledge sharing and transfer of best practices among scholars, practitioners, and industry stakeholders.
2. Provides actionable recommendations and frameworks to guide organizations in effectively leveraging FinTech innovations in inventory management.
3. Helps standardize processes and promote consistency in FinTech adoption across different organizations and industries.

Cons:

1. Best practices may not be universally applicable and may need to be tailored to suit specific organizational contexts or industry verticals.
2. Risk of outdated or irrelevant guidelines if not regularly updated to reflect evolving technologies and industry trends.
3. Implementation of best practices may encounter resistance from organizational culture, existing systems, or vested interests, requiring change management efforts to overcome.

4.3 Addressing Implementation Challenges

Addressing the challenges and barriers to FinTech adoption in inventory management requires concerted efforts to overcome technical, regulatory, and organizational

hurdles. This may involve developing technical standards, regulatory frameworks, and industry-wide protocols to facilitate the seamless integration of FinTech solutions into existing supply chain systems [15]. Additionally, proactive measures to address data privacy concerns, interoperability issues, and regulatory compliance requirements are essential to building trust and confidence in FinTech-enabled inventory management solutions. The pros and cons of these principles can be summed up as:

Pros:

1. Enhances trust and confidence in FinTech-enabled inventory management solutions by addressing concerns related to data privacy, interoperability, and regulatory compliance.
2. Promotes smoother integration of FinTech solutions into existing supply chain systems, minimizing disruption and maximizing adoption.
3. Creates a more conducive environment for innovation and experimentation by mitigating perceived risks and barriers to entry.

Cons:

1. Complex technical, regulatory, and organizational challenges may require time-consuming and resource-intensive solutions.
2. Regulatory changes or advancements in technology may outpace efforts to address implementation challenges, necessitating ongoing adaptation and flexibility.
3. Solutions to implementation challenges may not be universally applicable and may need to be tailored to the specific context and requirements of each organization.

4.4 Fostering Interdisciplinary Collaboration

Fostering interdisciplinary collaboration between researchers, practitioners, policymakers, and technology providers is crucial to driving innovation and knowledge exchange in the field of FinTech and inventory management [16]. By bringing together diverse perspectives and expertise from different disciplines, stakeholders can collectively develop holistic solutions to complex challenges and leverage complementary strengths to accelerate the adoption of FinTech innovations in supply chain operations. Interdisciplinary collaboration can also facilitate the co-creation of new knowledge, tools, and methodologies to address emerging trends and opportunities in the rapidly evolving landscape of FinTech and inventory management. The pros and cons for these points can be summarize as:

Pros:

1. Harnesses diverse perspectives, expertise, and resources from different disciplines to drive innovation and knowledge exchange.
2. Facilitates co-creation of holistic solutions to complex challenges by leveraging complementary strengths and insights.

3. Enhances interdisciplinary understanding and collaboration, fostering a culture of openness, creativity, and collaboration.

Cons:

1. Requires effective communication, coordination, and alignment of goals and objectives across interdisciplinary teams, which may be challenging to achieve.
2. Differences in disciplinary cultures, methodologies, and terminology may lead to misunderstandings or conflicts, requiring active efforts to bridge gaps and build mutual understanding.
3. Interdisciplinary collaboration may require additional time, resources, and effort to establish and maintain, potentially slowing down decision-making and implementation processes.

4.5 Promoting Continuous Learning and Adaptation

Promoting a culture of continuous learning and adaptation is essential for organizations seeking to harness the full potential of FinTech in inventory management [17, 18]. Recognizing that the technological landscape is constantly evolving, stakeholders must remain agile and responsive to changing market dynamics by staying abreast of emerging trends, technologies, and best practices. This may involve investing in ongoing education, training programs, and industry conferences to equip stakeholders with the knowledge and skills needed to navigate the complexities of FinTech-enabled inventory management effectively. By fostering a culture of continuous learning and adaptation, organizations can position themselves as leaders in leveraging FinTech innovations to enhance their inventory management practices and gain a competitive edge in the marketplace.

Pros:

1. Equips organizations with the knowledge and skills needed to stay abreast of emerging trends, technologies, and best practices in FinTech and inventory management.
2. Fosters a culture of innovation, agility, and resilience, enabling organizations to respond effectively to changing market dynamics and competitive pressures.
3. Promotes a mindset of continuous improvement and experimentation, driving ongoing optimization and refinement of inventory management practices.

Cons:

1. Requires ongoing investment in education, training programs, and professional development initiatives, which may strain limited resources or budgets.
2. Risk of information overload or decision fatigue if not managed effectively, leading to overwhelm or paralysis in decision-making processes.
3. Cultural barriers or resistance to change may hinder efforts to promote continuous learning and adaptation, requiring leadership buy-in and organizational support to overcome.

5 Conclusion

Literature reviewing financial technology (FinTech) and inventory management along supply chain suggests that several gaps exist. Existing studies are scarce in evaluating real time impacts of FinTech in inventory. In summary, a thorough and multidimensional strategy is required to fill in the gaps found in the literature about the incorporation of financial technology (FinTech) into supply chain inventory management. Strong evidence of the effect of FinTech adoption on inventory management measures can only be obtained through empirical investigations, and the creation of best practices and standards helps ensure successful implementation. To maximize the advantages of FinTech in inventory management, obstacles must be addressed, interdisciplinary collaboration must be fostered, and ongoing learning and adaptation must be encouraged.

Empirical research offers valuable insights into the tangible effects of FinTech adoption, guiding evidence-based decision-making for organizations seeking to optimize their inventory management processes. Concurrently, the development of best practices and guidelines provides actionable recommendations for effectively leveraging FinTech solutions, promoting consistency and standardization across industries. However, these efforts must be accompanied by strategies to address implementation challenges, such as data privacy concerns and interoperability issues, to ensure smooth integration and adoption.

Furthermore, fostering interdisciplinary collaboration fosters innovation and knowledge exchange, harnessing diverse perspectives and expertise to drive holistic solutions to complex challenges. Finally, promoting a culture of continuous learning and adaptation enables organizations to stay ahead of emerging trends and technologies, fostering agility and resilience in the face of evolving market dynamics.

In essence, by embracing a multidimensional approach that encompasses empirical research, best practices development, implementation strategies, interdisciplinary collaboration, and continuous learning, stakeholders can unlock the full potential of FinTech in inventory management within supply chains, driving efficiency, competitiveness, and sustainable growth.

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The Effect of Changing Murabaha Rates on the Financial Performance of the Islamic Banks Listed on a Stock Exchange



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Abstract The study seeks to investigate the influence of fluctuations in Murabaha rates on the financial performance of Islamic banks that are listed on the Amman Stock Exchange (ASE). To achieve this objective, a descriptive analytical approach is employed. The researchers collected data on the independent variable, which is the Murabaha rates, and measured the dependent variable, financial performance, using two indicators: Return on financial assets and return on equity. The data is collected from three Islamic banks (Arab Islamic Bank, Jordan Islamic Bank, and Safwa Islamic Bank) during the financial period from 2019 to 2022. The annual financial reports issued by these Jordanian Islamic banks listed on the ASE were reviewed for data collection purposes. The findings of the study revealed that there is indeed an impact of changing Murabaha rates on the financial performance of Islamic banks, as indicated by the two indicators. It is recommended, in light of the results, that Jordanian Islamic banks develop standardized formulas for Murabaha financing that align with the principles of Islamic banking, while also considering the needs of customers who require financing.

Keywords Change in Murabaha rates · On financial performance · Islamic banks

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1 Introduction

Islamic banks play a significant role in the banking sector and contribute to the economic growth of the countries in which they operate. These banks strictly adhere to rigorous standards and regulatory frameworks that align with the best international practices in terms of supervision and compliance.

In order to fulfill the goals of Islamic banks, which prioritize profit maximization within the boundaries of Islamic law, it becomes imperative to establish the pricing for the various products they offer. One such product is Murabaha, where the prices must encompass the cost of funds and generate profits, while also accounting for the expenses incurred by the bank.

The financial performance evaluation of this product necessitates the consideration of two key factors: achieving the targeted return on investment and attaining a profitable return ratio on the invested funds. This evaluation aims to provide an accurate assessment of the product's financial strength and to highlight its actual outcomes. Furthermore, the utilization of indicators is often essential in rectifying errors and identifying obstacles that impede the attainment of objectives.

The subject of pricing Murabaha products in Islamic banks has gained significance in light of the pandemic of COVID-19 and the rise in interest rates within the banking industry. This subject is relatively new given it relates to recent changes. However, pricing decisions play a significant role as they directly affect the financial performance and assets of an Islamic bank which includes sales volume that impacts annual profits and return on assets. In turn, these elements help determine the competitive standing for such Islamic banks that take part in ASE.

This research seeks to evaluate the impact of changes in Murabaha pricing on ASE-traded Islamic banks' financial performance. In order to address the research problem, the study will focus on addressing the following key question:

- What is the impact of changes in Murabaha rate pricing on the financial performance of Islamic banks listed on the ASE?

2 Previous Studies

The study of Murabaha financing and its ratios, as well as its impact on the financial performance of Islamic banks, has attracted considerable attention from many scholars. In a recent analysis of Iraqi Islamic banks, Hakar [1] delved into the details of Murabaha financing at these institutions. The results pointed out a significant upsurge in the return on investment rate through Murabaha financing. Indeed, this is a positive indication that Islamic banks are making strides towards effective utilization of this method. Supported these findings by showing that using Murabaha financing for procurement purposes enhances profitability for Islamic banks. Similarly, Al-Ambabi [2] presented empirical evidence supporting positive effects of

Murabaha financing on both liquidity and profitability for Islamic banks, implying an intertwined favorable relationship between these two aspects in such institutions.

Abu Al-Aliqah [3] found that Murabaha had a significant negative effect on return on assets, contrary to previous research findings. In another study, Musareh et al. [4] delved into the determinants of Murabaha margins and found operating expenses and funding volume to play a significant role. Moreover, Isa et al. [5] investigated Islamic Sharia's standpoint towards determining Murabaha rates in contracts and illustrated no contradiction between their practices and Islamic principles.

The primary objective of the present research is to examine the consequences of alterations in Murabaha ratios on the financial efficacy of Islamic banks that are publicly traded on the ASE. By doing so, this chapter intends to provide insights into the transactions conducted by Islamic banks and the extent of their impact during the critical period of the pandemic of COVID-19, encompassing both favorable and unfavorable aspects. These particular facets have not been adequately addressed in previous studies, which have either focused on different categories or examined different timeframes. As a result, this study offers a comprehensive conceptual framework encompassing various variables, thereby serving as a foundation for future investigations in this field.

3 Methodology of the Study

The current study adopted a descriptive-analytical methodology.

3.1 Study Population

The sample for this study comprises Islamic banks that are currently in operation and listed on the ASE. The selection process involved choosing three banks from the complete list of banks listed on the ASE, namely Jordan Islamic Bank, Arab Islamic International Bank, and Safwa Islamic Bank.

3.2 Data Collection Sources

- Secondary Sources: The data utilized for the purpose of constructing the theoretical framework were sourced from a variety of scholarly resources, including books, theses at the master's and doctoral levels, reputable websites, pertinent references, and prior research endeavors.
- Primary Sources: The research was dependent on the essential financial information obtained from the Islamic banks that were part of the selected sample, encompassing the timeframe spanning from 2019 to 2022.

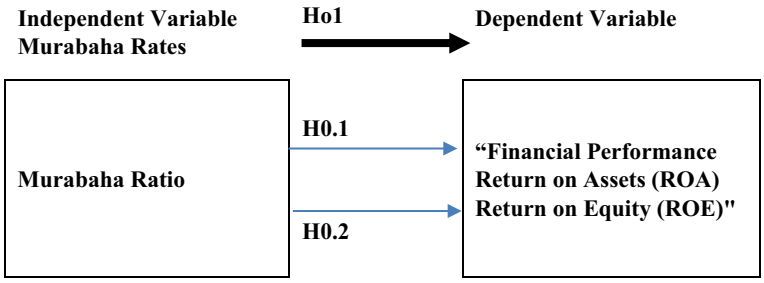


Fig. 1 Study model. *Source* Prepared by the researchers

4 Model of the Study and Its Hypotheses

4.1 Model of the Study

In order to fulfill the aims of this investigation and accomplish its objectives pertaining to the assessment of the influence of the independent variable on the dependent variable, a customized model was devised. The study's model and its variables are depicted in Fig. 1.

4.2 Hypotheses of the Study

Based on the problem statement and research questions, the following hypotheses were formulated:

Primary Hypothesis (H0)

- "There is no statistically significant impact at a significance level ($0.05 \geq$ a) of changes in Murabaha ratios on the financial performance of Islamic banks listed on the ASE."

From this primary hypothesis, the following sub-hypotheses are derived:

- Sub-Hypothesis 1 (H01): "There is no statistically significant impact at a significance level ($0.05 \geq$ a) of changes in Murabaha ratios on the return on assets of Islamic banks listed on the ASE."
- Sub-Hypothesis 2 (H02): "There is no statistically significant impact at a significance level ($0.05 \geq$ a) of changes in Murabaha ratios on the return on equity of Islamic banks listed on the ASE."

4.3 Study Variables Description

In this section, a comprehensive descriptive statistical analysis of both the dependent and independent variables of the study is presented, utilizing the annual financial data of Islamic banks listed in the ASE during the period of 2019–2022.

The descriptive statistics for all variables

The following is the descriptive statistics of all variables that are presented in Table 1.

The table provides a description of the independent and dependent variables as follows:

1. Throughout the study period spanning from 2019 to 2022, Islamic banks listed on the ASE exhibited an average annual mean return on financial assets of 0.186%, accompanied by a standard deviation of 0.115%. The highest recorded value reached 0.291%, whereas the lowest value observed was 0.038%.
2. During the study period from 2019 to 2022, the Islamic banks listed on the ASE exhibited an average annual mean return on equity of 9.227%, with a standard deviation of 4.784%. The range of returns varied, with the highest recorded value reaching 16.51% and the lowest at 2.026%. These figures suggest that Jordan Islamic Bank employed diverse strategies to generate profits, resulting in varying returns for investors. Notably, Safwa Islamic Bank achieved the lowest percentage return of 2.026% in the year 2019.
3. Throughout the study period (2019–2023), Islamic banks listed on the ASE experienced fluctuations in their Murabaha ratios. These changes exhibited an average annual mean of 358,001,358, with a standard deviation of 324,522,781. The highest recorded value reached 7,014,584, while the lowest value was documented at 5,142,261.

Below is a presentation of the descriptive statistics table for each bank separately:

The Table 2 presents a description of the independent and dependent study variables as follows:

- During the designated study period (2019–2022), the Jordan Islamic Bank exhibited a return on financial assets, with an annual arithmetic mean of 0.401%. Notably, the highest recorded value reached 0.272%, while the lowest value was recorded at 0.098%.

Table 1 Description of independent and dependent study variables

Variables	Mean	Standard deviation	Maximum value	Minimum value
Return on financial Assets	0.186	0.115	0.291	0.038
Return on equity	9.227	4.783	16.51	2.026
Changes in murabaha ratios	358,001,358	324,522,781	7,014,584	5,142,261

Table 2 Descriptive statistics for the dependent and independent variables of the Jordan Islamic Bank during the period (2019–2022)

The Scale%	Variables	Change In Murabaha Ratios	Return On Financial Assets	Return On Equity	Return On Financial Assets
Mean		679945941	0.401	13.841	0.401
Standard deviation		227940021	0.021	1.4259	0.021
Maximum value		776425780	0.272	15.49	0.272
Minimum value		416626719	0.098	11.81	0.098

- Throughout the study period (2019–2023), the Jordan Islamic Bank exhibited a return on equity, with an annual arithmetic mean of 13.841%. The highest recorded value stood at 15.49%, while the lowest value was noted at 11.81%.

The Table 3 presents a description of the independent and dependent study variables as follows:

1. During the study period from 2019 to 2022, the Arab Islamic Bank exhibited a return on financial assets. The annual arithmetic mean stood at 0.182%, with the highest recorded value being 0.297%, and the lowest value recorded at 0.11%.
2. During the designated study period (2019–2022), the Arab Islamic Bank demonstrated a return on equity, with an annual arithmetic mean of 12.110%. Notably, the highest recorded value reached 14.21%, while the lowest value was observed at 9.182%.

Table 4 presents a description of the independent and dependent study variables as follows:

1. Throughout the designated study period spanning from 2019 to 2022, Safwa Islamic Bank exhibited an annual arithmetic mean return on financial assets of 0.03%. Within this timeframe, the highest recorded value reached 0.01%, while the lowest value dipped to 0.093%.
2. Over the course of the study period (2019–2022), Safwa Islamic Bank demonstrated an annual arithmetic mean return on equity of 3.6951%. The recorded range for this metric ranged from a high of 7.881% to a low of 1.119%.

Table 3 Descriptive statistics for the dependent and independent variables of the Arab Islamic Bank during the period (2019–2022)

The Scale%	Variables	Change In murabaha ratios	Return on equity	Return on financial assets
Mean		315976987	12.11	0.182
Standard deviation		695514621	1.9214	0.088
Maximum value		308090501	14.21	0.297
Minimum value		40118859	9.182	0.11

Table 4 Descriptive statistics for the dependent and independent variables of the Safwa Islamic Bank during the period (2019–2022)

The Scale%	Variables	Change in murabaha ratios	Return on equity	Return on financial assets
Mean		882537003	3.6951	0.03
Standard deviation		501495308	2.6214	0.032
Maximum value		234751987	7.881	0.01
Minimum value		5025789	1.119	0.093

Table 5 Normal distribution test for study variables

Number	Variable	Skewness	Kurtosis
1	Financial assets	0.163	2.409
2	Ownership rights	0.691	2.417
3	Murabaha rate change	0.841	2.639

4.4 Normal Distribution Test

To assess the conformity of data to a normal distribution, one approach is to perform tests for skewness and kurtosis. These statistical measures serve to identify the presence of normal distribution. Skewness quantifies the degree of asymmetry in the data relative to the mean, with a value close to zero indicating normal distribution. Conversely, kurtosis measures the degree of peakedness or flatness in the distribution. In a normal distribution, the kurtosis value approximates 3. The outcomes of these tests are presented in Table 5.

Based on the data presented in Table 5, it can be deduced that the skewness values pertaining to all dimensions under investigation exhibit a proximity to zero, whereas the kurtosis values demonstrate a proximity to 3. This observation suggests that the variables being studied follow a normal distribution.

4.5 Stationary Test for Study Variables

The constancy of both the mean and the variance of series values over time is indicative of the stability of time series. The covariance between two time periods is only dependent on the time gap (lag) and not on the specific time when the variance is measured. In order to determine whether the study variables are stationary, the Unit Root test is employed. The Levin-Lin Chu (LLC) test is utilized to examine whether the variables contain a unit root and are suitable for panel data associated with time. If the variables do contain a unit root, differencing is necessary to achieve stationarity. It is important to conduct a Unit Root test in order to evaluate the stationarity

Table 6 Unit root test results for study variables

Variable	Computed value at level	p-value	Result
Financial assets	−13.087	0.000	Stationary
Ownership rights	−16.741	0.000	Stationary
Murabaha rate change	−19.571	0.000	Stationary

of time series, as many non-stationary time series can still yield high values for (R^2, F, t)leading to misinterpretation and misleading outcomes.

The LLC test employs a decision rule that relies on the detection of a unit root, which signifies non-stationarity of the time series. When the computed test statistic's significance level exceeds 0.05, it indicates the presence of a unit root. The findings are displayed in Table 6.

Based on the information presented in Table 6, it is clear that the time series data for all variables under investigation exhibited stationarity throughout the observed period, with a significance level of 5%. This conclusion is drawn from the fact that the p-values did not surpass the 5% threshold. As a result, we can confidently reject the notion of a unit root and affirm that these time series are indeed stationary.

4.6 Heteroskedasticity Test

In order to ascertain the absence of heteroskedasticity, the researchers utilized the Breusch-Pagan test to assess residual heteroskedasticity. This statistical test evaluates the hypothesis that the variance of the errors remains constant, as opposed to the alternative hypothesis that the variance of the errors increases in relation to the values of the dependent variable. Specifically, higher values of the dependent variable are associated with larger errors. The findings from this analysis revealed no evidence of heteroskedasticity, as presented in Table 7.

Based on the data presented in Table 7, it is clear that the study models do not exhibit any heteroskedasticity problems. The statistical analysis using the Chi-square distribution yielded p-values of 0.762 and 0.766 for the three models, which did not reach the threshold of statistical significance at the 5% level. Consequently, we accept the null hypothesis of homoskedasticity, indicating that the error variance remains constant.

Table 7 Results of Heteroskedasticity Test

Hypothesis	Chi2	p-value
HO1	0.010	0.762
HO2	0.014	0.766

Table 8 Lagrange multiplier and hausman test

Hypothesis	Test	Chi2	Sig	Most Accurate and Consistent Model
HO1	Lagrange multiplier	66.41510	0.00	Fixed effect model
	hausman	2.147019	0.815	
HO2	Lagrange multiplier	73.22151	0.00	Fixed effect model
	hausman	2.17413	0.901	

4.7 Model Estimation

In order to accomplish the goals of the study, the researchers implemented the Panel Approach, which involved incorporating time series data for variables within the model (cross-sectional data) from the sample over the duration of the study. The researcher utilized estimation techniques that are specifically designed for longitudinal panel data models, including:

3. Pooled Regression Model (PRM).
4. Fixed Effect Model (FEM).
5. Random Effect Model (REM).

Based on the analysis presented in Table 8, the utilization of the Lagrange Multiplier test allows for the distinction between the Pooled Regression Model and the Random Effect Model. The scientific hypothesis posits that the Pooled Regression Model exhibits greater consistency compared to the Random Effect Model. On the other hand, the Hausman test is employed to differentiate between the Fixed Effect Model and the Random Effect Model. The null hypothesis (HO) proposes that the Random Effect Model demonstrates higher levels of consistency than the Fixed Effect Model. Consequently, the findings derived from Table 7 indicate that the Fixed Effect Model provides the most accurate estimation for the subsidiary hypotheses associated with it.

4.8 Hypothesis Testing

Simple Linear Regression analysis was used to test the hypotheses.

Hypothesis 1 Testing

- H01: "There is no statistically significant effect at a significance level of $\alpha \leq 0.05$ for changing the pricing of Murabaha rates on the return on financial assets in the Islamic banks listed on the ASE."

The hypothesis was tested using Simple Linear Regression at a significance level of $\alpha \leq 0.05$. The findings are presented in Table 9.

Table 9 Results of simple linear regression testing for hypothesis 1

Independent variable	Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Value of B	Critical t	Calculated t	Significance level (Sig)
Independent	Murabaha Rate Change	0.601	0.406	0.606	1.873	11.221	0.000
Dependent	Financial Assets						

- To ascertain the significance of the regression model employed, the extracted critical t-value was compared with the calculated t-value. It was observed that the calculated t-value (11.221) surpasses the critical value (1.87), thereby indicating the statistical significance of the regression model utilized.
- As shown in Table 8, the t-test yielded a significance level of (0.000), indicating that it is lower than the predetermined significance level of the study (0.05). Consequently, the null hypothesis is rejected in favor of the alternative hypothesis, which asserts that there is a statistically significant impact, at a significance level of ($\alpha \leq 0.05$), of altering the pricing of Murabaha rates on the return on financial assets in the Islamic banks listed on the ASE.
- The R^2 value, which measures the proportion of variance in the dependent variable (Financial Assets) explained by the independent variable (Murabaha Rate Change), was determined to be 0.406. This indicates that approximately 40.6% of the variability in Financial Assets can be accounted for by changes in Murabaha Rate.

Hypothesis 2 Testing

- H02: "There is no statistically significant effect at a significance level of $\alpha \leq 0.05$ for changing the pricing of Murabaha rates on the return on equity in Islamic banks listed on the ASE."

The hypothesis was tested using Simple Linear Regression at a significance level of $\alpha \leq 0.05$. The findings are presented in Table 10.

Table 10 Results of simple linear regression testing for hypothesis 2

Independent variable	Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Value of B	Critical t	Calculated t	Significance level (Sig)
Independent	Murabaha rate change	0.530	0.300	0.451	1.873	9.037	0.000
Dependent	Equity Returns						

- In order to ascertain the significance of the regression model employed, the critical t-value was obtained and compared to the calculated t-value. The results revealed that the calculated t-value (9.037) surpasses the critical value (1.87), thus affirming the statistical significance of the regression model.
- Based on the data presented in Table 10, it is evident that the significance level for t was found to be (0.000), which is below the predetermined significance level of the study (0.05). Consequently, the null hypothesis is rejected in favor of the alternative hypothesis, which affirms that there exists a statistically significant impact, at a significance level of ($\alpha \leq 0.05$), in altering the pricing of Murabaha rates on the return on equity in Islamic banks listed on the ASE.
- The R^2 value, which signifies the degree of explanation provided by the independent variable (Murabaha Rate Change) on the dependent variable (Equity Returns), was calculated to be 0.300. This indicates that approximately 30% of the variability in Equity Returns can be accounted for by changes in Murabaha Rate.

5 Discussion of Results

The study yielded the following results:

- The findings of this study reveal a notable impact of fluctuations in Murabaha rates on the return on financial assets within Islamic banks that are listed on the ASE. This result aligns with the study carried out by Al-Ambabi [2], which also noted considerable disparities in returns of financial assets among various banks. These findings stress how important it is to have a good balance when managing assets and liabilities. This forms the basis of resource allocation for both short-term and long-term financing activities. Addressing liquidity, profitability, and risk management, in turn, ensures a sustainable institution where optimal finance is achieved. The results also indicate that Islamic bank management uses its financial resources prudently, showing signs of revenue generation through a non-conservative financing policy that has positive implications on their profit rates. This finding is interesting as it provides some insight into what other institutions could consider emulating if they aim at improving their performance indicators.
- New research has uncovered an interesting relationship: how changes in Murabaha rates can affect the equity returns of Islamic banks trading publicly on the ASE. This finding echoes a study by Al-Raqeeb et al. [6] which also found a strong connection between financing via profit-sharing investments and equity returns—likely due to efforts made by Islamic bank management towards improving solvency ratios. This news fits well with their work; it appears that these numbers do paint a picture after all.

- Within the period of investigation from 2019 to 2022, an analysis was carried out to establish the mean yearly yield of monetary resources for Islamic banking institutions which appear on the ASE. Results from this examination show that the typical yearly return stood at 0.186%, with a standard deviation of 0.115%. The maximum recorded figure hit 0.291% while the minimum value noted was 0.038%.
- During the aforementioned time frame, Islamic banks in Jordan exhibited an average annual return on equity of 9.227%, accompanied by a standard deviation of 4.784%. Notably, the highest recorded return reached 16.51%, whereas the lowest stood at 2.026%. These statistics highlight the diverse strategies employed by Jordanian Islamic banks in their pursuit of profit generation, with the objective of expanding investment portfolios and enhancing returns for investors. Specifically, Safwa Islamic Bank achieved the lowest return rate of 2.026% in the year 2019.

5.1 Recommendations

Based on the aforementioned results, the study recommends:

1. Islamic banks in Jordan should establish permanent financing formulas consistent with Islamic banking principles to remain competitive while complying with Sharia law.
2. Islamic banks should adopt Shariah-compliant pricing formulas that meet the financial needs of various sectors, ensuring consistency with Islamic principles.
3. Emphasis must be placed on ensuring that Shariah-compliant financial products and prices reflect the goal of facilitating genuine trade, thereby contributing to economic growth.
4. Continuous efforts should be made to maintain high levels of liquidity, enabling Islamic banks to expand Islamic financing and respond to customer needs in all circumstances, which will have a positive impact on profit rates.
5. Decision makers in Islamic banks should focus on increasing operational efficiency to ensure high profit margins, which will positively impact their financial performance.
6. Further research should explore other financing modes such as Mudarabah and Musharakah in financing different sectors of Islamic banks.

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The Possibility of Islamic Banks Dealing with Tawarruq Disciplined by the Sharia Standard



Suhail Al-Ahmad, Odeh Abdullah, Alaa Sartawi, and Khaled Alzeaideen

Abstract This research dealt with the issue of the areas through which the product of Tawarruq can be used disciplined by the Sharia standard issued by the Accounting and Auditing Organization for Islamic Financial Institutions, where it stood on the nature of jurisprudential and disciplined Tawarruq, as well as the Sharia standards issued by AAOIFI, then talk about the definition of the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), and the research also dealt with the Sharia position of dealing with disciplined Tawarruq and its reality and the areas through which Tawarruq can be applied, including: Repayment of debts of customers coming to Islamic banks while previously bearing usurious debts, where they are subjected to a tawarruq process to collect cash with which they extinguish those debts under the supervision of the bank, revolving credit cards (with a repayment period of more than the usual month), where the cardholder is issued Tawarruq and his proceeds are deposited in his account for deduction when using the card, financing travel tickets if it is not possible to finance them with leasing, and so on according to the details and readings addressed by this research.

Keywords Ayoufi · Disciplined Tawarruq · Sharia standards · Islamic banks · Access to finance

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1 Introduction

Praise be to Allah, Lord of the Worlds, and prayers and peace be upon our master Muhammad, the master of all creation, his family and companions, and those who follow his Sunnah with charity until the Day of Judgment, and after;

The Sharia standards issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) have included the controls and cases in which Islamic banks may deal with the Tawarruq product, in addition to the procedures required to be adhered to by banks before starting to provide the product, in order to meet the needs of those dealing with Islamic banks, as these Sharia standards have shown through Tawarruq Standard No. (30) that Islamic banks should limit the use of Tawarruq to avoid deficit or lack of liquidity to meet the need and avoid losing their customers and disrupting their operations. Because Tawarruq is not a form of investment or financing, but it is permitted for the need on its terms… Where the criterion is stated in Appendix (B) (Sharia Provisions Document) not to launch, promote or expand the work of Tawarruq in a way that disrupts the work of the basic formulas for investment and financing, and this results in the institution not being tawarruq except in the narrowest scope as in the standard. It also entails limiting Tawarruq to customers in the case where the purpose of their operations cannot be achieved through participation, speculation, murabaha, leasing, istisna'a and the like from investment and financing formulas, or in the case of ridding customers of debts resulting from usurious dealings and not just to pay their usurious obligations, hence this research came to discuss the fact of Tawarruq disciplined by the Sharia standard and the areas of its application and implementation by Islamic banks under the title: The possibility of dealing with Islamic banks with disciplined Tawarruq according to the Sharia standard, according to the axes and topics of their statement and details as follows.

2 The First Axis: Introducing the Sharia Standards Issued by AAOIFI

The Sharia standards issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) are, in fact, the most important Sharia controls for the work of Islamic banks at the present time, and compliance with these Sharia standards is one of the elements of any Islamic bank's commitment to Sharia controls in its business, as these standards are approved in 90% of Islamic banks and financial institutions worldwide, and these standards are prepared by the Sharia Board in the Authority, which consists of 16 scientists and researchers, some of whom represent banks and some have their experience and status in Islamic financial industry, and they are among the finest sheikhs specialized in Islamic financial economics [1].

The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) is one of the most prominent international non-profit organizations

supporting Islamic financial institutions, established in 1991 and headquartered in the Kingdom of Bahrain, and has great professional achievements, foremost of which is the issuance of 100 standards so far in the fields of accounting, auditing, business ethics and governance, in addition to the Sharia standards adopted by central banks and financial authorities in a group of countries as mandatory or indicative. Central banks, regulatory authorities, financial institutions, accounting and auditing firms and law firms from more than 45 countries, and the standards of the Authority are currently applied by leading Islamic financial institutions around the world, which have provided an advanced degree of harmonization of Islamic financial practices globally [2].

3 The Second Axis: The Meaning of Tawarruq Disciplined by the Legal Standard

The origin of tawarruq is the request for money from silver, then the concept turned into the demand for cash, whether silver, gold, or paper currency, where the origin of the word remained, and its meaning expanded according to the expansion of the concept of cash, and this means: the cash liquidity obtained by individuals or banks through tawarruq by buying the commodity badly, and then selling it in cash to a non-seller for less than what he bought it with, thus obtaining cash [3].

The sale of tawarruq is the purchase of a commodity in the possession of the seller and his property at a deferred price, and then the buyer sells cash to a non-seller to obtain paper cash [4]. It was said that the customer asks the bank to buy a commodity to benefit from its price, and then the bank is obligated to the customer to sell the commodity on his behalf, and this obligation, if not in the condition of the contract, is by virtue of custom and custom (Fiqh Council Resolution No. (2), 1424), or the bank agrees with a person who needs cash to sell him a commodity for a term at a price higher than the price of the day, and then the buyer assigns the bank to sell the commodity to him at a cash price usually lower than the deferred price at which he bought the commodity, so that the tawarruq obtains the cash price, and his liability remains occupied with the bank at the higher price for this transaction [5].

Tawarruq in Standard No. (30) of the Shariah Standards issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI): It is the purchase of a commodity at a forward price bargaining or Murabaha and then selling it to other than the person from whom it was purchased to obtain cash at a current price. It differs from the sample as in the standard in that the sample buys a commodity at a future price and then sells it to the person from whom it was purchased at a lower price [2].

It is also a way out to avoid usury, not a trick to it, because it becomes to him who does not find a lender and does not want to fall into borrowing with interest (Sharia Standards 2023).

4 The Third Axis: Differentiating Between Disciplined Tawarruq According to the Sharia Standard and the Sample

Tawarruq is based on two contracts: one of which owns a commodity from the (Mustawaruq) Tawarruq by Murabaha or deferred sale, through the bank, and the second contract: a contract of sale in which the Tawarruq sells the commodity to a person other than the one who bought it from him to avoid the sample.

It is stated in informing the signatories of the Lord of the Worlds regarding the distinction between them: "If he returns the commodity to its seller, it is the sample, and if he sells it to someone else, it is Tawarruq" [6].

In the sample, when the seller retrieves his commodity, it is as if it never came out of his hand, and its presence in the sale is the same as its absence, and its mediation is a burden, and the matter ends up paying an amount of money to another in more than one of its kind for a term, which is usury, but in Tawarruq, nothing happens to the seller, because the commodity does not return to him in the first place, but rather moves with an independent contract to a new buyer, the purchase of which has nothing to do with the first sale [7].

The Shariah criterion was based on the difference in the rule of Tawarruq from the rule of the sample that the sample is a trick on usury because it falls between two parties who are in fact a borrower and a lender by selling the commodity on deferred and then recovering it at a current price and the buyer obtaining less money than what he is obligated to the seller, and the majority of jurists to prevent the sample, and on the permissibility of Tawarruq except Ibn Taymiyyah and Ibn al-Qayyim, where they said in Tawarruq prevention or hatred. (Sharia Standards 2023).

The Tawarruq can be the customer by buying the commodity subject to Tawarruq from the institution and then selling it to others to collect liquidity, and the Tawarruq can be the institution by buying the commodity subject to Tawarruq and selling it to a third party to collect liquidity, from the customer or from another institution in accordance with the controls for Tawarruq (Al-Ayoufi, Standard No. 30).

5 Fourth Theme: The Sharia Position on Tawarruq Disciplined by the Sharia Standard

With regard to Tawarruq, the Shariah Standard No. (30) of the Shariah Standards was issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) and it has set controls that keep it away from suspicions and caveats that made the Council of the Islamic Fiqh Council of the Muslim World League in its second resolution on the subject of Tawarruq in its seventeenth session, held in Makkah Al-Mukarramah in the period 19–23/10/1424 AH corresponding to 13–17/12/2003 AD, preventing him from doing so after the Islamic windows of conventional banks seized him and violated its controls, the most important of which are:

Not obliging the customer to authorize the bank selling the commodity to him to sell it on his behalf, because this obligation negates the certainty of the existence of the commodity, so it is a fictitious act, and it was called (organized Tawarruq), through the banks' typical work, in which the sale of a commodity—not of gold or silver—from the global commodity markets or others, is arranged on the borrower at a future price, provided that the bank is committed—either under a condition in the contract, or by virtue of custom and custom—to act on his behalf in selling it to another buyer at a price The Academy has decided that this organized Tawarruq is not permissible for the following things: that the seller's obligation in the Tawarruq contract by proxy to sell the commodity to another buyer, or the arrangement of the person who buys it—makes it similar to the sample that is prohibited by Sharia, whether the obligation is explicitly conditional, or by virtue of custom and custom, and because this leads in many cases to a breach of the conditions of the legitimate arrest necessary for the validity of the transaction, and that the reality of this transaction is based on granting cash financing by increasing This transaction is not the real Tawarruq known to the jurists, which the Academy in its fifteenth session had previously said that it was permissible, with real transactions and specific conditions, including its decision, because of the many differences between them, in which the research presented was detailed, as the Academy's decision stipulated: "This sale of tawarruq is permissible in Shariah, and the majority of scholars have said that the principle of sales is permissibility, for the Almighty says: Allah permitted the sale and forbade usury, and there was no usury in this sale, neither intentionally nor in form, and because there is a need for that to pay a debt, or to marry, or otherwise." [4], and the Academy did not stipulate in its decision only that it is different from the sample, then came the decision of the seventeenth session, which includes other conditions that were taken into account in this criterion, the most important of which is the non-commitment of the bank "seller" to rely on the customer in the sale of the commodity that makes it similar to the sample according to the text of the decision, and not to prejudice the arrest, and the decision did not require real arrest, but only in the decision of its eleventh session with the judgmental arrest in the exchange, which is more severe than the sale (Sharia Standards 2023).

The difference between the two deferred prices and the situation does not fall within the property of the bank, which occurred in the transaction for the purpose of justifying obtaining an increase in the financing provided to this person by fictitious transactions in most cases, and this is not available in the transaction shown by some banks.

This is what made the Sharia standard No. (30) of the Sharia standards is based on the reservation on the obligation of power of attorney and that the narrow use of the power of attorney and therefore has made it here such as (disciplined Tawarruq), and here the fatwas went to the importance of stipulating in the Tawarruq documents that: "The customer's right to keep the commodity or sell it himself or authorize whoever he wants to sell it, including the bank, without obliging the customer to authorize him", and in the text of Article (54) of the Code of Judicial Judgments forgivable in the unforgivable dependencies In other cases (if the buyer and the seller receives the

sold item, it is not permissible, but if he gives a bag to the seller to eat and put the food sold in it, he does so, it is a receipt from the buyer).

In item No. (5/1) of Sharia Standard No. (30) and Appendix (B) (Sharia Rulings Document) it is stipulated that: Tawarruq is not a form of investment or financing, but it is permitted for the need under its conditions… The criterion was added in Appendix (B) (Sharia Provisions Document) not to launch, promote or expand the work of Tawarruq in a way that disrupts the work of the basic formulas of investment and financing, and this results in the institution's non-Tawarruq except in the narrowest scope as in the standard. It also entails limiting Tawarruq to customers in the case where the purpose of their operations cannot be achieved through Musharaka or Mudaraba, Murabaha, leasing or Istisna'a and other forms of investment and financing or in the case of ridding customers of debts resulting from usurious dealings and not just to pay their usurious obligations.

According to the Shariah standard, the use of Tawarruq should be limited to avoiding a deficit or shortage of liquidity to meet the need and avoid the loss of its customers and the disruption of its operations.

6 Fifth Theme: Cases in Which Islamic Banks Can Deal with Tawarruq

The legal fatwas went on to say that it is important to stipulate in the Tawarruq documents that are executed by Islamic banks that the customer has the right to keep the commodity or sell it himself or authorize whomever he wants to sell it, including the bank, without obliging the customer to authorize him, as Article (54) of the Ottoman Code of Judicial Judgments stipulates that: It is forgivable in the dependencies what is unforgivable in others, where if the buyer and the seller in the receipt of the sale is not permissible, but if he gives a choir to the seller to kiel And he put the food sold in it, and he did so and that was a receipt from the buyer. A fatwa (No. 19297) was issued by the Permanent Committee for Research and Issuing Fatwas in the Kingdom of Saudi Arabia (Fatwas of the Permanent Committee for Research and Issuing Fatwas in the Kingdom of Saudi Arabia, No. 19297), stating that Tawarruq is permissible: "The issue of Tawarruq is to buy a commodity at a deferred price, and then sell it at a current price other than the one from whom you bought it at the deferred price, in order to benefit from its price, and this work is OK among the majority of jurists, and this is what made Sharia Standard No. (30) one of the Sharia standards. Issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) [1], with the reservation on the obligation to power of attorney as the use of the power of attorney is narrow, and this means disciplined tawarruq, that is, the customer has the right, if it is used, to keep the commodity or sell it himself, or to authorize whoever he wants to sell it, including the bank, without obliging the customer to authorize him, and based on the adoption of Sharia controls related to Islamic banks' dealing with Tawarruq product in accordance with

the provisions and controls of Sharia Standard No. (30), there are several applications and areas that are inevitable to deal with Tawarruq Regulated by the Sharia standard [8], which are as follows:

1. Paying the debts of customers coming to Islamic banks while previously incurring usurious debts, where they are subjected to a tawarruq process to collect cash with which they extinguish those debts under the supervision of the bank.
2. Revolving credit cards (with a repayment period of more than the usual month) where the cardholder is issued Tawarruq and his proceeds are deposited in his account for deduction when using the card (the Shariah standard for cards).
3. Contractors' obligations for labor expenses, emergency services and payment of employees' salaries.
4. Financing travel tickets if they cannot be financed by Ijara (Ijara Services).
5. Financing customers' purchase of gold with illiquidity to require contracting, and it is not permissible to murabaha in that, because in banking applications it is deferred.
6. Repaying debts incurred by traders and companies in the event of a liquidity deficit and the inability to apply other liquidity instruments, such as peace, buying an asset and then leasing it.
7. Party expenses (marriage, graduation, birthday) if the service lease cannot be applied, especially for the payment of the dowry in cash.

7 Conclusion

Praise be to Allah, Lord of the Worlds, that we have completed this effort and we ask God Almighty for success and payment, and after, we conclude in this station the most important results of the research, as follows:

- The Islamic Fiqh Council decided that the sale of tawarruq is permissible in Shariah, because the principle of sales is permissibility, and this sale did not appear in usury, neither intentionally nor in form, and because there is a need to do so to spend a debt, marriage, or others.
- In its decision, the Fiqh Council stipulated only that Tawarruq should be different from the sample.
- The Fiqh Council decided on other conditions for Tawarruq that were taken into account by the Sharia standard, the most important of which is the non-commitment of the bank "seller" to rely on the customer's behalf in the sale of the commodity that makes it similar to the sample, and not to prejudice the real or judgmental arrest in the exchange.
- One of the Sharia controls related to the dealing of Islamic banks with a Tawarruq product in accordance with the provisions and controls of Sharia Standard No. (30) is the payment of debts of customers coming to Islamic banks while previously bearing usurious debts, where they are subjected to a Tawarruq process to collect cash with which they extinguish those debts under supervision and so on.

- Tawarruq is to buy a commodity at a deferred price, and then sell it at a current price other than the one from whom you bought it at the deferred price, in order to benefit from its price, and this work is okay with the majority of jurists.
- Regarding Tawarruq, Shari'a Standard No. (30) of the Shariah Standards was issued by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) and controls were set for it to avoid suspicions and Sharia caveats.

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Determinants of Cash Holdings: Evidence from High Uncertainty Environment



Islam Abdeljawad, Aya Abdelhaq, and Ezeya Shareef

Abstract This study investigates the determinants of cash holding in manufacturing companies listed on the Palestine Exchange between 2012 and 2022. Palestine is an emerging economy characterized by high uncertainty environment due to political instability and occupation. Data were collected manually from audited annual financial statements. Fixed effect regression analysis reveal that cash flow and profitability have a positive impact on cash holding, while firm size and leverage have a negative influence on cash holding. These results provide insights into the financial management practices of Palestinian industrial enterprises and offer implications for decision-makers in optimizing cash holding strategies.

Keywords Cash holding · Manufacturing firms · Uncertainty · Political instability · Palestine

1 Introduction

Cash represents a highly liquid portion of current assets, readily available to address a company's immediate requirements including bill payments, investments, and unforeseen expenses. Cash holdings (CHs) play a crucial role in a company's financial management, influenced by various factors including industry dynamics, and competitive environment. Industries characterized by high uncertainty or volatility often see companies holding more cash as a precautionary measure against unexpected events [1, 2]. In today's competitive business environment, effective financial resource management is essential, highlighting the importance of adequate cash within organizations. Insufficient cash reserves can impede a company's operations and hinder its smooth functioning. Therefore, it is imperative for businesses to maintain an appropriate level of cash to meet various needs [3, 4].

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The amount of cash held by corporations is a major topic of study in finance, with consequences for business practices. However, the advantages of having liquid assets are subject to debate, with two primary benefits enabling organizations to invest in rewarding opportunities as they arise. Firstly, liquid assets eliminate the need to liquidate assets for payments, thereby reducing transaction costs. Secondly, liquid assets provide flexibility when alternative options are either unavailable or too costly for the business [5, 6]. While maintaining an adequate level of cash is crucial for sustaining operations, an excess of cash can introduce various challenges, including higher opportunity costs, potential misuse of funds, and increased agency costs. The balance between having sufficient cash and avoiding excessive holdings is critical for businesses. Therefore, understanding the factors influencing a firm's cash-holding decisions is essential.

Economic uncertainty significantly influences CHs, with companies often increasing their cash reserves during uncertain economic periods as a precautionary measure or to seize emerging opportunities [7]. Moreover, the recent financial crisis has underscored the importance of cash and its management. Effective cash management becomes critical during periods of limited liquidity to ensure optimal utilization of available funds [8]. The study focuses on the distinctive environment of Palestine, characterized by its political, regulatory, and business demographics. The situation in Palestine, which is characterized by occupation and limited access to essential services and interregional communication, presents difficulties like governance problems, political instability, and insufficient regulations, all of which reduce investor and management trust [2, 9, 10]. In politically turbulent environments like this, businesses face heightened information asymmetry, leading to a greater necessity for maintaining cash reserves [11, 12].

The goal of this study is to determine the factors that influence cash holdings, which are important for businesses because they provide stability and financial flexibility. Numerous variables, including firm size, profitability, liquidity, net working capital, and cash flow, will be examined in the study. The study intends to shed light on these variables in order to shed light on the factors that influence CHs and how they affect firm value. Solving this research issue could provide insightful information about the variables influencing a company's CHs and inform strategies for risk management and optimal financial performance [13, 14].

This research problem underscores the importance of understanding the determinants of firm's CHs in a unique environment. Studying the determinants of CHs is important for several reasons. Firstly, it aids in understanding a company's financial decision-making by examining the factors influencing its CHs. This can assist investors and analysts in comprehending a company's risk management strategies and investment decisions. Second, because CHs can be a predictor of a company's future financial performance, it makes forecasting future performance easier. Businesses with large cash reserves may be better equipped to weather economic downturns or grasp new opportunities, while those with small cash reserves may be more vulnerable to financial difficulties [15]. In general, researching the factors that influence CHs can provide important information about the financial standing, investment strategy, and corporate governance procedures of a business. As a result, analysts and

investors may be able to manage risk and make better-informed investment decisions [16, 17].

2 Study Framework

2.1 Theoretical Background

The determination of optimal CHs involves consideration of numerous variables [4, 5, 18, 19]. Numerous theoretical models have been put forth by corporate finance researchers to explain the variables influencing a company's decision to hold cash. The trade-off theory, the pecking order theory, and the free cash flow theory are the three primary models that provide information about the CHs of corporations.

2.1.1 Trade-Off Theory

This theory is often regarded as the cornerstone of the literature on cash management. This theory states that businesses weigh the costs and benefits of holding cash to determine the ideal amount. Having a significant amount of cash on hand offers both advantages and disadvantages for businesses. Benefits include the ability to leverage trade discounts and maintain a favorable credit rating. Companies with robust cash positions often attract investor interest, which can benefit the business in the long term. However, one drawback is the missed opportunity for income generation since cash held does not earn returns. Moreover, maintaining insufficient cash reserves can also have negative repercussions, making it challenging for a business to meet short-term obligations and needs.

By effectively managing their cash assets, businesses aim to maximize the benefits derived from them. Cash reserves serve as a protective buffer for firms, enabling them to mitigate the costs associated with external borrowing or liquidating current assets to finance future growth. Therefore, strategic management of cash assets is essential to harness the advantages they offer [2, 5].

2.1.2 The Pecking Order Theory

This theory [20] offers an alternative perspective on investment decisions by incorporating the financing dimension. This model emphasizes the sequence in which investments should be financed.

The pecking order theory states that in order to minimize costs related to information asymmetry, companies should finance investments using retained earnings first, then safe debt, risky debt, and equity [20]. Within this framework, companies do not establish specific target levels of cash but instead utilize cash as an intervening

measure between retained earnings and investment requirements. Holding cash is therefore a means to avoid reliance on external sources of finance.

As a result, companies draw on their cash reserves to finance new investments. They subsequently resort to additional debt issuance and, if necessary, equity issuance when they cannot meet existing debt obligations. Cash and debt are intertwined because the cash level is influenced by financing and investment decisions. Consequently, companies use cash to fulfill dividend payments, meet debt obligations, and accumulate excess cash when resources exceed investment needs [1, 21]. Consequently, cash balances fluctuate over time, decreasing when investments exceed retained earnings and increasing when retained earnings surpass investment requirements.

2.1.3 The Free Cash Flow Theory

This theory, introduced by Jensen [22], delves into the dynamics between investors (delegating authority) and managers (acting as agents) responsible for executing assigned tasks. Jensen [22] posits that managers are incentivized to accumulate cash as it affords them greater control over assets and discretionary authority in making investment decisions for the company.

By maintaining excess cash, managers gain the ability to pursue investments that may not be feasible through financial markets. Moreover, entrenched managers, as highlighted by Fama and Jensen [23], retain surplus cash to evade market discipline due to their risk aversion and poor diversification. Ferreira and Vilela [24] claim that cash gives managers the freedom to give projects that best suit their interests precedence, even if those projects don't always benefit shareholders. As a result, managers are under less pressure to perform well.

The concept of "free cash flows" emerges from managers exploiting corporate CHs to further their own interests, thereby exacerbating conflicts with shareholders [22]. Since the firm's cash-holding policy is subject to managerial discretion, the amount of cash held raises concerns when managers act against the best interests of shareholders. Viewing CHs as risk-free investments, risk-averse managers increase cash retention to mitigate the firm's exposure to risk before abandoning projects with potentially high positive net present value but associated risks [21, 25].

2.2 Hypothesis Development

A sound cash policy is essential for businesses even in prosperous times to meet obligations efficiently and avoid escalating costs or insolvency. The management of cash assets often determines a company's success or failure [4, 26]. CHs are crucial for sustaining ongoing operations and meeting working capital requirements [27].

The primary factors influencing a company's CH level are cash needs. As a coping mechanism, the amount of cash held increases with economic uncertainty. The availability of investment opportunities is one factor that influences CHs. When companies have numerous profitable investment options, they may opt to hold less cash to allocate resources towards these opportunities. Conversely, when attractive investment options are limited, companies may hold more cash until better prospects arise. Additionally, a company's dividend policy can impact its cash reserves, with higher dividend payouts generally resulting in lower CHs [28]. However, several firm characteristics, including company size, profitability, leverage, cash flows and net working capital, also influence the level of CHs.

a. *Firm size*

Firm size is a key determinant of a company's CHs. Small businesses typically maintain higher cash reserves than larger counterparts as a precautionary measure. Uyar and Kuzey [29] claim that larger companies tend to maintain higher cash levels compared to smaller counterparts, leveraging their greater resources for diverse investment ventures. Ahmed et al. [27] found that business size significantly influences corporate CHs.

However, research by Angelovska and Valentinčič [30] indicates that smaller, more liquid companies tend to have higher cash. Effective cash management is essential to a small business's financing strategy because they frequently depend more on short-term financing [30]. Because they have less access to outside funding than larger companies, small and medium-sized enterprises can really benefit from the saying "cash is king" [31]. Using this justification, we develop the first hypothesis:

H1: Firm Size has a negative influence on cash holdings.

b. *Leverage*

Leverage is a major factor in the rise in corporate CHs, as shown by Kariuki et al. [32], which is consistent with the precautionary motive. It is hypothesized that because leveraged companies are more likely to experience financial difficulties, they have a greater propensity to accumulate cash. Moreover, high leverage can lead to underinvestment issues. Holding cash as a reserve helps mitigate this potential agency costs associated with debt [33]. Abdeljawad et al. [34] revealed that leverage had a favorable impact on CH. While high leverage ratios describe a company's capacity to raise money from third parties by issuing debt, other studies by Abdeljawad et al. [34], Shubita [35], and Jamil et al. [36] found no impact of leverage on CH.

However, Ferreira and Vilela [24] argue that financial institutions, with their stronger monitoring role, are likely to discourage CH in businesses with high levels of debt. This viewpoint is consistent with the claim made by Ozkan and Ozkan [37] that leverage, because debt is a stand-in for cash, can be used as a gauge of a company's ability to issue debt. As such, one would anticipate a negative correlation between leverage and CHs. Additionally, Ahmed et al. [27] discover a negative correlation between leverage and corporate cash balances. Leverage and CHs are negatively correlated, according to numerous research studies [38–40]. Based on this argument, we formulate the second hypothesis:

H2: Leverage negatively affects the amount of cash held.

c. *Cash Flow*

The effect of cash flow on a company's CHs is a topic of debate. Because of the asymmetry of information and communication problems associated with external funding, companies have been observed to favor internal financing over external financing [20]. According to Kim et al. [41], cash flow offers investments and maturing liabilities a quick source of liquidity. Businesses with larger cash flows are less likely to encounter financial difficulties and may have fewer constraints on investing in profitable opportunities. During challenging business conditions, cash serves as a safety net to withstand negative shocks and enhance the likelihood of survival [42]. The apprehension of having to reduce dividends or face potential losses from forced asset sales to raise funds is also aligned with the precautionary argument for maintaining capital reserves. These arguments support the positive association between cash flow and CHs. Based on the above, we formulate the third hypothesis:

H3: Cash Flow has a positive influence on cash holding.

d. *Profitability*

The influence of profitability on CH is a subject of interest in prior research. Abushammala and Sulaiman [43] and Ali et al. [44] suggest a positive relationship between profitability and CH. This implies that companies with substantial cash reserves tend to exhibit strong financial performance. Additionally, Rasyid's [45] study's results show a positive correlation between CH and liquidity.

However, Tripathy and Uzma [38] found contrasting results, indicating that profitability has a minimal effect on CH. Additionally, Al-Najjar [46] discovered a negative association between profitability and CH. Inadequate liquidity management can lead to cash shortages and hinder the firm's ability to meet obligations, thereby negatively impacting profitability. Based on previous arguments, we expect the following:

H4: Profitability has a positive influence on cash holding.

e. *Liquidity*

The presence of more liquid assets—which are regarded as alternatives to cash—on a company's balance sheet in addition to cash and marketable securities can have an impact on the ideal amount of CHs. Because liquid assets are easier to convert into cash than other types of assets, it makes sense that companies with higher amounts of liquid assets would also have lower levels of cash on hand. Higher liquidity companies are usually better able to use their liquid assets to satisfy their short-term financial obligations. For instance, Ferreira and Vilela [24] demonstrated how liquid assets can serve as substitutes for cash. According to the trade-off theory, cash and net working capital have a negative relationship. This is so because the bulk of net working capital is made up of liquid assets, which can act as cash substitutes. Similar findings are presented by Basheer [47] and Chireka and Fakoya [48], indicating that liquidity has a detrimental effect on CH. According to Bates et al. [39], net working capital excluding cash is a good indicator of the amount of liquidity a corporation

Table 1 Measurement of variables

Variable type	Variable	Measurement of variable	Reference
Dependent variable	Cash holdings	Cash/total assets	[38]
Independent variables	Firm size	Natural logarithm of the total assets	[38]
	Leverage	Total Liabilities/total assets	[24]
	Cash flow	Cash flow from operating/total assets	[50]
	Profitability	ROA = net profit/total assets	[38]
	Net working capital	(Current assets-current liabilities)/total assets	[51]

holds. A company is likely to maintain low cash levels if it has numerous cash alternatives. Earlier researchers such as Ferreira and Vilela [24] also predicted a similar association. However, Nafees et al. [49] have found a direct relationship between liquidity and CH.

Consequently, research has shown a negative correlation between CHs and liquidity, indicating that lower CHs are linked to higher liquidity. We develop the fifth hypothesis in light of the aforementioned:

H5: Liquidity has a negative influence on cash holding.

3 Methodology

This section details the data collection, sample of study, measurement of variables and statistical techniques utilized to carry out this study.

3.1 Data Collection and Variable Measurement

The secondary data required to measure the study variables was obtained from the annual reports of all industrial enterprises listed on the Palestine Exchange, available on the Palestine Exchange website between 2012 and 2022 given that the information is accessible. The measurement of variables is presented in Table. 1.

3.2 Models

We continue by estimating the model that pinpoints the factors influencing CHs in Palestinian industrial businesses. To investigate the relationship between CHs (the dependent variable) and different explanatory variables, such as cash flow, leverage, firm size, net working capital, and profitability (the independent variables),

we use multiple regression analysis with fixed effects and robust standard errors. The regression model is specified as follows:

$$\text{Cash Holdings} = \beta 0 + \beta 1\ \text{Cash Flow} + \beta 2\ \text{Leverage} + \beta 3\ \text{Net Working Capital} + \beta 4\ \text{Firm Size} + \beta 5\ \text{Profitability} + \in \quad (1)$$

where

β0–β5 are the regression coefficients representing the relationship between the respective independent variables and CHs. ϵ is the error term and the variables were discussed in Table 1.

4 Results and Discussion

4.1 Descriptive Statistics and Correlation Analysis

The descriptive statistics and correlation analyses for each of the study's variables are shown in this section. Table 2 lists the mean, median, highest point, lowest point, and standard deviation for of the sample consisting of industrial companies listed in PEX.

According to the results, the average CHs have a mean value of 6.1%. However, the median value of CHs is 4.5%, highest level observed for the variable "cash holdings" is 25%, while the minimum value recorded for the same variable is 0%, representing instances where there are no CHs.

The firm size has a mean value of 7.29, a median value of 7.38, a maximum value of 8.09, and a lowest value of 5.88. Leverage, cash flow, profitability, and net working capital have mean values of 0.327, 0.057, 0.053, and 0.237, respectively. The highest and lowest values for each of the aforementioned variables are listed in Table 2 together with their standard deviations. The foundation for additional analysis and discussion of the study's findings is laid by these descriptive statistics, which offer insightful information about the distribution and properties of the variables under investigation.

Table 2 Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev	Observations
Cash holdings	0.061	0.045	0.250	0.000	0.058	121
Cash flow	0.057	0.057	0.231	− 0.269	0.073	121
Firm size	7.294	7.376	8.090	5.881	0.519	121
Leverage	0.327	0.288	2.456	0.054	0.248	121
NWC	0.237	0.267	0.616	− 0.493	0.233	121
Profitability	0.053	0.058	0.318	− 0.622	0.101	121

Table 3 Correlation Analysis

Correlation	(1)	(2)	(3)	(4)	(5)	(6)
1. Cash holdings	1.000					
2. Cash flow	0.487	1.000				
3. Firm size	− 0.273	-0.127	1.000			
4. Leverage	− 0.176	0.035	− 0.201	1.000		
5. NWC	0.466	0.304	0.259	− 0.382	1.000	
6. Profitability	0.497	0.277	0.302	− 0.238	0.407	1.000

Table 3 presents a correlation matrix between CHs and explanatory variables, including cash flow, leverage, firm size, net working capital, and profitability. The correlations between CHs and these variables are as follows: 0.487 for cash flow, − 0.176 for leverage, − 0.273 for firm size, 0.466 for net working capital, and 0.497 for profitability.

The correlation matrix indicates bivariate relationships between CHs and the other variables. It also indicates that no two independent variables exhibit a strong correlation to raise concerns about multicollinearity in regression analysis, ensuring the reliability of the regression results.

4.2 Model Estimation

Table 4 displays the findings of the study model's estimation. The R-square is 73%, and the F test is significant indicating the significance of the model. Panel fixed effects are used in estimating this model based on Hausman test and robust standard errors accounted for the possible heteroscedasticity and autocorrelation.

The findings indicate a negative influence of firm size on CHs, which is consistent with previous research findings [30, 52]. However, these results do not align with the findings of other studies [53].

Furthermore, the findings show a negative correlation between leverage and CHs. This implies that businesses with greater levels of leverage frequently use it to finance their operations or as a substitute for cash on hand. These findings align with previous studies [24, 27, 37, 39]. However, they differ from the findings of other studies [32, 45] which suggest that leverage has positive influence on CH.

Additionally, the findings show that cash flow positively affects CHs. This suggests that businesses tend to hold larger amounts of cash reserves when their cash flow ratio is higher. These findings are consistent with Jebran and Iqbal [54] and Aftab et al. [53]. However, they contradict the outcomes of other studies, including those by Kim et al. [41].

Companies that generate higher profits are more inclined to retain a portion of their earnings as cash or cash equivalents, resulting in increased CHs. This implies that profitability has a positive influence on CHs, as financially successful firms

Table 4 Estimation results

Dependent variable: cash holdings			
Variable	Coefficient	Std. Error	Prob
Cash flow	0.214	0.053	0.000
Firm size	-0.041	0.024	0.094
Leverage	-0.042	0.020	0.035
NWC	0.040	0.036	0.276
Profitability	0.126	0.049	0.011
C	0.343	0.173	0.051
R-squared	0.731		
Adjusted R-squared	0.693		
F-statistic	19.037		
Prob (F-statistic)	0.000		
Durbin-Watson stat	1.306		
Total panel (balanced) observations	121		
Method: panel least squares			
Cross-section fixed (dummy variables) (Hausman test prob. = 0.00)			
Cross-section weights (PCSE) standard errors & covariance (d.f. corrected)			

tend to accumulate and maintain larger cash reserves. This positive relationship has significant implications for CH. The findings of this study align with the conclusions drawn by Ali et al. [44], Nafees et al. [49], Abushammala and Sulaiman [43], and Rasyid [45], all of whom found a favorable impact of profitability on CH. However, these findings diverge from the results of other studies, such as Basheer [47], and Chireka and Fakoya [48], who suggest a negative relationship between profitability and CH.

CH is not impacted by net working capital. The findings of this investigation were consistent with those of Shubita [35] who found that CH is not influenced by liquidity. However, the outcome of this investigation did not agree with that of other studies such as Bates et al. [39], Ferreira and Vilela [24], Rasyid [45], and Ali and Yousaf [52] who asserted that liquidity is associated with CH.

5 Conclusion

In conclusion, this study has provided valuable insights into the determinants of CHs in an environment characterized by high uncertainty and political instability, namely, Palestine. The findings suggest that smaller firms tend to hold more cash relative to their total assets compared to larger firms. Firms with higher levels of leverage tend to hold more cash, possibly as a means of managing financial obligations and securing operational financing. Cash flow positively affects CHs, and profitable firms are likely

to accumulate higher levels of cash reserves. Net working capital has no effect on CHs.

Overall, the study contributes to the understanding of CH determinants in Palestinian industrial enterprises. However, it is important to acknowledge the limitations of the study, including the small sample size due to the small number of manufacturing firms in Palestine. This may hinder the generalizability of the results. Future research could expand the scope to include other sectors and incorporate additional independent variables to further explore the factors influencing CHs. This recommendation aims to advance the knowledge and understanding of corporate cash management in Palestinian industrial enterprises and similar contexts.

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The Effect of Corporate Governance and Tax Avoidance on Firm Value of Industrial and Service Companies



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Abstract This study is aimed at investigating the effects of corporate governance and tax avoidance on firm value. The motivation behind conducting this study lies in analyzing, understanding, and proving the extent of the impact of governance practices and the level of tax avoidance on firm value in Jordan. Multiple regression was used to analyze panel cross-sectional data for 38 industrial companies and 41 service companies listed on the Amman Stock Exchange (ASE) that make up the sample from 2010 to 2021. The study finds that the board size increases the firm value for the sample of service companies. However, we find an insignificant effect of the presence of women on boards of directors, audit committee size, and tax avoidance on firm value. As for the control variables included in the study, the results show that return on assets, leverage, and firm size have a significant effect on firm value. The results indicate that the role of corporate governance is unclear in enhancing the value of companies in Jordan, which raises doubt about the true application of corporate governance rules by Jordanian companies. Based on the findings, there is a need for increased government interest in encouraging companies to implement corporate governance.

Keywords Corporate governance · Tax avoidance · Firm value · Jordan

1 Introduction

Tax avoidance is a ubiquitous practice observed across various societies and economic systems. In this context, the need for tax compliance is increasingly recognized as essential to generating the revenue needed to support various development

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initiatives. This need is particularly evident in developing countries with large fiscal deficits that are heavily dependent on public sector borrowing [30].

While the effects of tax avoidance at the national level are largely harmful, proponents argue that it could boost the value of firms through substantial tax savings [3, 26] (Rego and Wilson 24). The primary focus of companies remains on enhancing their long-term value, which is often reflected in their performance in the stock market [29]. On the other hand, some believe that the pursuit of profit maximization often entails higher tax liabilities, prompting managers to engage in tax avoidance practices. Thus, this may distort the information conveyed in financial statements, which can lead to an inconsistency in the information between the company and its investors [21, 26].

Historically, corporate tax avoidance has been viewed as a way to transfer tax savings from the government to shareholders in an attempt to increase shareholder value. However, an emerging body of work rooted in agency theory emphasizes the intimate connection between tax avoidance and corporate governance as it affects agency costs. The complexity and ambiguity of tax avoidance tactics may provide managers involved in different types of profit-taking with a cover, such as the use of complex financial structures, as evidenced by the Enron case in the 1990s. Enron's involvement in structured finance transactions led to tax avoidance, government prosecution and eventual collapse (Rego and Wilson 24).

Tax avoidance brings various economic benefits to companies, and management's pursuit of tax relief meets shareholder expectations [10]. The investment community, researchers, accountants, economists, regulators, and market analysts are becoming more interested in tax planning activities. However, the adoption of tax planning practices remains controversial [13]. Furthermore, tax avoidance strategies are crucial management factors influenced by managerial perspectives [17].

There is an effective role for corporate governance in controlling board decisions related to tax avoidance. Sunarto et al. [27] found a significant impact of corporate governance on tax avoidance. According to the findings of Abdul Wahab et al. [2], board size plays a pivotal role in controlling the management's aggressive behavior regarding tax avoidance. It is believed that increasing the size of the board of directors enhances the distribution of supervisory functions in strategic decision-making by the executive management. In the contract, Hoseini et al. [16] did not find any significant impact of board size on tax avoidance.

Corporate governance and tax avoidance are fundamentally related to the performance and value of companies in the business environment. Some studies examined corporate governance, tax avoidance, and other variables in Jordan. Almaharmeh et al. [8] examined the impact of corporate governance on tax avoidance. Alkurdi and Mardini [7] studied the impact of ownership structure and the board of directors' composition on the extent of tax avoidance strategies. Almaharmeh et al. [8] investigated the effect of ownership structure dimensions in Jordanian manufacturing companies on tax avoidance, with a moderating effect of audit quality. Alsmady [9] examined the effect of political connections on corporate tax avoidance with the moderate role of accounting information quality in Jordanian companies.

Still, in the Jordanian market, there appears to be a gap in understanding about how several indicators associated with corporate governance, including board gender diversity and size, along with the size of the audit committee, as well as tax avoidance, affect the firm value of companies. This study is motivated by the inconsistent findings of previous studies on the impact of corporate governance and tax avoidance on firm value. To the researchers' knowledge, the impact of corporate governance and tax avoidance on firm value has not been studied in the Jordanian context. The current study adds value to auditors, the income tax department, and company management. This can be achieved by improving transparency and accuracy in financial reporting and facilitating the audit process to achieve greater efficiency and reliability.

2 Literature Review and Hypothesis Development

2.1 Corporate Governance and Firm Value

Corporate governance is the laws and standards that determine the relationship between the company's management on the one hand and the shareholders and parties associated with the company (bondholders, workers, suppliers, creditors, consumers) on the other hand. Good corporate governance is a structure used by a company to improve the progress of the company without leaving the interests of other stakeholders in accordance with laws, standards and ethical values [11, 19].

The value of a company is highly dependent on corporate governance. Due to the volatility of corporate governance frameworks between countries due to divergent social, economic and financial conditions, the effects of corporate governance also vary [4]. That was supported by Askar et al. who found that the audit committee forced owners and management to cooperate with shareholders and maximize stakeholders' wealth. By providing accurate and transparent data to the company, the audit committee may contribute to increasing the value of the company [21, 22].

It is believed that the large board size detracts from the value of the company. According to Abusharbeh [5], there is a common misconception that a smaller board size leads to higher shareholder value because larger boards are overburdened with more control and suffer from poor communication and collaborative decision-making. Jensen [18] and Ramdani and Witteloostuijn [23] suggest that large board sizes are less beneficial. However, it is it is believed that when the CEO also serves as the chairman of the board of directors, the company's performance increases, which increases the value of the company. Afes and Jarboui [6] examined how good corporate governance affected 160 UK companies' financial performance between 2005 and 2018, taking into consideration the unique characteristics of different business sectors. The findings demonstrated that implementing sound corporate governance improves a company's financial performance as determined by its return on equity.

In contrast, some studies did not find any effect of cooperate governance on firm value. Mangoting et al. [19] studied the impact of corporate governance on

firm value using board size, board gender diversity, independent commissioners, and audit committees. The size, diversity, and audit committee of the board, among other elements of good corporate governance, had no effect on the value of the company.

Due to the contradictory effect of corporate governance on firm value the first hypothesis is stated as follows:

H1: Corporate Governance is significantly affect the firm value of companies in Jordan.

2.2 Tax Avoidance and Firm Value

Tax avoidance is an attempt to legally reduce a taxpayer's taxes. It is legitimate because it uses tax laws and regulations rather than violating them. Tax avoidance indicates and shows the management interest that managers seek to achieve, which may sometimes be personal. This is done by reducing the company's profits, which ultimately leads to the data in the financial statements not showing the real situation and creating the possibility of information asymmetry between the company and investors [25, 31].

Tax avoidance provides many financial benefits to the company and shareholders. By reducing the company's income and thus the tax paid, the management of the corporation attempts to reduce the amount of taxes paid in order to enhance shareholders' wealth [10]. For a business, taxes are a major expense. In general, tax savings boost cash flows, shareholder wealth, and after-tax profits. For well-governed firms, Desai and Dharmapala [12] found a positive relationship between tax avoidance and firm value. Thus, it is expected that companies will actively participate in tax reduction initiatives. Rego and Wilson (24) provide empirical evidence explaining how companies significantly incentivize managers to engage in tax avoidance. According to research by Sunarto et al. [27], reduced effective tax rates result from rewarding business unit managers who support indicators of after-tax success.

On the other hand, tax avoidance has many negative effects on the company and shareholders, the most important of which is the possibility that the tax authorities will discover this and consider it a type of tax evasion, which gives a bad impression of the company in the local community [16]. At the same time, the method of tax avoidance is also one of the crucial managerial choices determined by managers' means [31]. A study by Guedrib and Marouani [15] examined the impact of tax risks and tax avoidance on corporate value of non-financial institutions listed on the Tunisian Stock Exchange were analyzed between 2008 and 2020. The results showed that tax risks reduce the positive impact that tax avoidance has on corporate value. Because of this, tax avoidance and tax-related issues need to be considered when evaluating the effect on business value. Further analyses reveal that tax avoidance reduces the value of a company when combined with a high degree of tax risk. The study conducted by Supanji et al. [28] investigated the correlation between tax

avoidance and firm value and corporate governance. The results indicate that the tax avoidance factor affect firm value.

Based on the above literature, we expect that tax avoidance activities of Jordanian companies will affect firm value. Therefore, our second hypothesis is as follows:

H1: Tax avoidance has a significant effect on firm value.

3 Study Design and Methodology

In order to fulfill study objectives, the impact of corporate governance and tax avoidance on firm value will be examined as follow.

3.1 Data Collection, Methodology and Statistical Methods

The study used secondary data obtained from Amman Stock Exchange. Multiple regression was used in order to examine the effect of independent variables on the dependent variable. The study sample includes industrial and service companies listed on Amman Stock Exchange whose data was completed for the years 2010 to 2021. The variables that were used in the study are firm value as a dependent variable, corporate governance and tax avoidance as independent variables, and firm size, leverage and profitability as control variables.

The following regression model is estimated to test the effect of corporate governance and tax avoidance on firm value:

$$\begin{aligned}\text{FIRMVAL it} = {} & \alpha + \beta 1\ \text{TAXAVOID it} + \beta 2\ \text{BORDSIZE it} + \beta 3\ \text{BORGDIV it} \\ & + \beta 4\ \text{AUDITCOMMIT it} + \beta 5\ \text{FIRMSIZE it} + \beta 6\ \text{LEV it} \\ & + \beta 7\ \text{PROF it} + \text{e it} \end{aligned} \quad (1)$$

where

FIRMVAL	is the firm value,
TAXAVOID	is the tax avoidance,
BORDSIZE	is the board,
BORGDIV	is the board gender diversity,
AUDITCOMMIT	is the Audit committee,
FIRMSIZE	is the firm size,
LEV	is the Leverage,
PROF	is the company's profitability.
α	Firm and year fixed effect.
β1–β7	Regression coefficients.

Table 1 Variable definitions and measurements

Variable	Measurement
• *Dependent variables*	
Firm value (Tobins Q)	(Equity market value + book value of debts)/total assets
• *Independent variables*	
Tax avoidance (effective tax rate (ETR))	ETR = (Total tax expenses)/(Income before tax)
Board size	The number of the board directors
Board gender diversity	The number of female directors / The number of the board directors
Audit Committee	The number of the Audit Committee / The number of the board directors
• *Control variables*	
Firm size	The logarithm of total asset of the firm
Leverage	Total long-term debt divided by total assets
Profitability	Net income divided by total equity (return on equity)

it Firm i in period t.

Variables are defined and measured in Table 1:

3.2 Population and Sample of the Study

The study sample included 38 industrial companies and 41 service companies listed on Amman Stock Exchange, whose data was available for the years 2010 to 2021.

4 Data Analysis

The following tests have been used in order to find out the main effect between the major study variables which are the corporate governance, tax avoidance and firm value:

1. Descriptive statistics.
2. Correlation analysis using Pearson's correlation coefficient which is used to find out the relationship and its strength between the study's variables.
3. Multiple regression analysis is used to test the impact of the independent variables on the dependent variables of the study.

4.1 Descriptive Statistics

Table 2 displays descriptive statistics for the various main variables related to the study sample for the years 2010 to 2021. First, for tax avoidance, Table 2 displays an average of 9.6%, with some variation indicating a standard deviation of approximately 0.1561. This indicates that the companies in the study sample pay an average of 9.6% income tax, noting that the tax rate according to the Jordanian income tax law and for industrial and service companies is 14% during the period from 2010 to 2018, and it became 20% after the law was amended in the year 2019. In light of this result, it is noted that industrial and service companies, according to the above result, actually pay a tax rate that is about 10% lower than the rate specified by the law. This may be due to several reasons, the most important of which may be: the companies sampled in the study practice tax avoidance strategies. The other reason is due to the presence of losses. This is evident from the fact that the lowest value of the effective tax rate was − 81.4%.

Regarding corporate governance, the results showed that the average size of boards of directors is 8.44, and that the minimum is 4 members and the maximum is 13 members. This result is consistent with the Jordanian Companies Law and Article (132), which stipulates the size of the Board of Directors consisting of 3–13 members. The average value for audit committee size is about 25.5%, which means that on average, companies in the sample tend to have audit committees equal to 25.5% of the board size. Additionally, the presence of female directors is relatively low on average, with an average proportion of approximately 4.2%, suggesting that gender diversity on corporate boards is limited, as reflected by the small standard deviation of around 0.092.

The company value shows an average of 1.0801, which is close to one, which indicates that the market value of the study sample companies is very close to the book value, with some difference between the study sample companies due to a standard deviation of about 0.4963.

Table 2 Descriptive statistics of all sampled companies (2010–2021)

	N	Minimum	Maximum	Mean	Std. deviation
Tax avoidance	908	− 0.814	2.033	0.096	0.156
Board size	903	4	13	8.440	2.259
Audit committee size	775	0	1	0.255	0.342
Board gender diversity	904	0	0.5	0.042	0.092
Firm value	880	0.207	3.654	1.080	0.496
Firm size	908	12.925	21.31	17.236	1.411
Leverage	908	0	0.96	0.367	0.241
Profitability (ROE)	908	− 0.315	0.508	0.035	0.112
Valid N (listwise)	749				

4.2 Correlation Analysis

Table 3 presents Pearson's correlation coefficients for dependent variable, independent variables and control variables. This test assesses the strength of the relationship between the variables of the study and the significance of the relationships between the variables.

The correlation matrix presented in Table 3 reveals the following results:

First, "Tax Avoidance" is positively associated with "Firm Size" (R = 0.164(and significant at the 0.01 level and "Tax Avoidance" is strongly associated with "Profitability (ROE)" (R = 0.317 and significant at the 0.01 level). This suggests that larger companies are more likely to engage in tax avoidance, and tax avoidance practices are associated with higher profitability.

Second, "firm value" is positively associated with "firm size" (R = − 0.071) and significant at the 0.05 level and "firm value" is positively associated with "profitability (ROE)" (R = 0.347) and significant at the 0.01 level, indicating that companies with higher values tend to be bigger and more profitable.

Third, "board size" shows a positive and statistically significant correlation with "firm size" (R = 0.416) and significant at the 0.01 level, indicating that as firm size increases, board size tends to be larger. That is, larger companies tend to appoint a larger number of board members, and vice versa. In addition, there is a significant positive relationship between "board size" and "firm value," (R = 0.066 and significant at the 0.05 level), implying that companies with larger board size tend to have higher value.

Fourth, "board gender diversity" is positively associated with "Audit Committee," (R = 0.08) and significant at the 0.05 level, indicating that firms with more female directors are more likely to have large audit committees. At the same time, "board gender diversity" is positively associated with "Profitability (ROE)," (R = 0.112 and significant at the 0.01 level), indicating that companies with more female directors tend to be associated with higher profitability. In addition, "board gender diversity" is negatively associated with "Financial Leverage," (R = − 0.224) and significant at the 0.01 level. This indicates that increasing the number of female members on the board of directors reduces the debt ratio, which may mean that women are generally more conservative than men and less risk-tolerant.

Fifth, "Audit Committee" is negatively correlated with "Board Size", (R = − 0.238) and significant at the 0.01 level and "Audit Committee" is negatively correlated with "Company Size", (R = − 0.111 and significant at the 0.01 level), indicating that firms with large board sizes are more likely to have small audit committee sizes, and large firms tend to have smaller audit committee sizes.

Finally, "leverage" is positively associated with "firm size" (R = 0.375 and significant at the 0.000 level) indicating that larger companies tend to have higher leverage ratios.

Table 3 Pearson correlation analysis

	Board size	Board gender diversity	Audit committee	Tax avoidance	Firm value	Firm size	Leverage	Profitability (ROE)
Board size	1							
Board gender diversity	0.022	1						
Audit committee	− 0.238**	0.080*	1					
Tax avoidance	− 0.013	0.058	0.023	1				
Firm value	0.066*	0.021	− 0.022	0.080*	1			
Firm size	0.416**	− 0.051	− 0.111**	0.164**	0.071*	1		
Leverage	0.076*	− 0.224**	0.012	0.009	− 0.039	0.375**	1	
(ROE)	0.042	0.112**	− 0.091*	0.317**	0.347**	0.273**	− 0.030	1

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

4.3 Regression Analysis

This section presents the results of the regression analysis; first for the industrial sector, then for the service sector and finally for both sectors.

4.3.1 Industrial Sector Regression Model

Table 4 presents the results of the first model test in the study. The use of multiple regression testing requires low correlation between the independent variables in the model to avoid the problem of multicollinearity. The last two columns in the table display collinearity statistics (tolerance and VIF) to assess the level of multicollinearity between variables. The results of collinearity statistics tests, with Tolerance values near 1 and VIF values around 1 indicate that there is no multicollinearity problem in the first model of the study.

In this particular model, various independent and control variables (x1, x2, x3, x4, x5, x7, and x8) are being examined for their effect on the dependent variable (x6: Firm Value). The table shows that the adjusted R square of the model is 17.8%, which means that the independent variables and control variables can explain about 17.8% of the variation in firm value. The results also reveal that the model significantly explains the variation in the firm value at a significance level of less than 0.05 with F

Table 4 Regression results for model (1): industrial sector

	Beta	t	Sig.	Collinearity statistics	
				Tolerance	VIF
(Constant)		3.485	0.001		
x1(board size)	0.072	1.416	0.158	0.830	1.204
x2 (board gender diversity)	0.019	− 0.386	0.700	0.928	1.077
x3 (audit committee size)	− 0.007	− 0.147	0.883	0.942	1.061
x4 (tax avoidance)	− 0.002	− 0.046	0.963	0.905	1.104
X6 (firm size)	− 0.054	− 1.044	0.297	0.811	1.233
x7 (leverage)	0.230	4.595	0.000	0.855	1.170
x8 (ROE)	0.462	8.873	0.000	0.793	1.261
R square	0.193				
Adjusted R square	0.178				
F	12.815				
Sig.	0.000				

[a] Dependent variable (x5): firm value
[b] Independent variables (X1, X2, X3, X4)
[c] Control variables (X6, X7, X8)

value = 12.815. This indicates that the predicted variables have a significant impact on firm value, making the model valuable for further analysis and interpretation of the data.

Table 4 includes standardized coefficients (Beta), t-statistics (t) and significance levels (Sig). Notably, the constant has a significant value of 0.001, which represents the baseline value of x6 when all predictors are zero. Each predictor specifies its effect on x6, while standardized coefficients express these effects in standard deviation units. The t-statistics assess the statistical significance of each predictor, with lower *p*-values indicating higher significance.

Remarkably, return on equity and leverage variables show a highly significant coefficient (*p*-value of 0.000), indicating their significant impact on the firm value. Conversely, board size, female directors, audit committee, tax avoidance, and firm size show coefficients with *p* values higher than 0.05, indicating no statistical significance in predicting firm value in the context of this regression model. Overall, this model provides crucial insights into the impact of the predictors on the firm value, highlighting the significant role of leverage and return of asset, while noting the comparatively lower impact of other variables.

4.3.2 Service Sector Regression Model

Table 5 displays the results of testing the second model in the study related to service companies. The results of collinearity statistics tests, with Tolerance values near 1 and VIF values around 1 indicate that there is no multicollinearity problem in the second model of the study.

In this model, various independent and control variables (x1, x2, x3, x4, x5, x7, and x8) are being examined for their effect on the dependent variable (x6: Firm value). The table shows that the adjusted R square of the model is 9.2% which means that the independent variables and control variables can explain about 9.2% of the variation in firm value. In addition, the results reveal that the model significantly explains the variation in the firm value at a significance level of less than 0.05 with F value = 4.786. This indicates that the predictor variables have a significant impact on firm value, making the model valuable for further analysis and interpretation of the data.

Table 5 includes standardized coefficients (Beta), t-statistics (t) and significance levels (Sig). Notably, the constant has a significant value of 0.000, representing the baseline value of x6 when all predictors are zero. Each predictor specifies its effect on x6, while the standardized coefficients express these effects in standard deviation units. The t-statistics assess the statistical significance of each predictor, with lower p-values indicating higher significance.

Remarkably, return on equity, board size and firm size variables show a highly significant coefficient (*p*-value less than 0.05), indicating their significant impact on the firm value. Conversely, board gender diversity, audit committee, tax avoidance, and leverage show coefficients with *p* values higher than 0.05, indicating no statistical significance in predicting firm value in the context of this regression model. Overall,

Table 5 Regression results for model (2): service sector

	Beta	t	Sig.	Collinearity statistics	
				Tolerance	VIF
(Constant)		3.631	0.000		
x1(board size)	0.239	3.295	0.001	0.660	1.515
x2 (board gender diversity)	− 0.023	− 0.373	0.709	0.941	1.063
x3 (audit committee size)	− 0.024	− 0.353	0.724	0.777	1.287
x4 (tax avoidance)	0.088	1.421	0.156	0.905	1.104
X6 (firm size)	− 0.187	− 2.804	0.005	0.775	1.290
x7 (leverage)	0.084	1.371	0.172	0.918	1.089
x8 (ROE)	0.261	4.370	0.000	0.969	1.032
R square	0.116				
Adjusted R square	0.092				
F	4.786				
Sig.	0.000				

[a] Dependent variable (x5): firm value
[b] Independent variables (X1, X2, X3, X4)
[c] Control variables (X6, X7, X8)

this table provides crucial insights into the impact of the predictors on the firm value, highlighting the significant role of return on equity, board size and firm size variables, while noting the comparatively lower impact of other variables.

4.3.3 All Company's Regression Model

Table 6 provides the results of testing the third model in the study related to industrial and service companies. The results of collinearity statistics tests, with Tolerance values near 1 and VIF values around 1 indicate that there is no multicollinearity problem in the second model of the study.

In this model, various independent and control variables (x1, x2, x3, x4, x5, x7, and x8) are being examined for their effect on the dependent variable (x6: Firma Value). The table shows that the adjusted R square of the model is 16.6%, which means that the independent variables and control variables can explain about 16.6% of the variation in firm value. In addition, the results reveal that the model significantly explains the variation in the firm value at a significance level of 0.000 with F value = 22.223. This indicates that the predictor variables have a significant impact on firm value, making the model valuable for further analysis and interpretation of the data.

Table 6 includes standardized coefficients (Beta), t-statistics (t) and significance levels (Sig). Notably, the constant has a significant value of 0.000, representing the baseline value of x6 when all predictors are zero. Each predictor specifies its effect

Table 6 Regression results for model (3): both sectors

	Beta	T	Sig.	Collinearity statistics	
				Tolerance	VIF
(Constant)	1.190	5.090	0.000		
x1(board size)	0.015	0.408	0.684	0.781	1.280
x2 (board gender diversity)	− 0.011	− 0.326	0.745	0.928	1.078
x3 (audit committee size)	0.018	0.519	0.604	0.934	1.071
x4 (tax avoidance)	− 0.017	− 0.480	0.631	0.922	1.085
X6 (firm size)	− 0.035	− 0.832	0.406	0.642	1.557
x7 (leverage)	− 0.044	− 1.172	0.242	0.800	1.249
x8 (ROE)	0.427	11.793	0.000	0.852	1.174
R square	0.174				
Adjusted R square	0.166				
F	22.223				
Sig	0.000				

[a] Dependent variable (x5): firm value
[b] Independent variables (X1, X2, X3, X4)
[c] Control variables (X6, X7, X8)

on x6, while the standardized coefficients express these effects in standard deviation units. The t-statistics assess the statistical significance of each predictor, with lower p-values indicating higher significance.

The results show that the return on equity variable has a high significance coefficient (*P* value less than 0.05), indicating their significant impact on company value. In contrast, board size, female directors, audit committee, tax avoidance, firm size and financial leverage show coefficients with p-values higher than 0.05, indicating relatively lower statistical significance in predicting firm value in the context of this regression model. Overall, this model provides crucial insights into the impact of the predictors on the firm value, highlighting the significant role of ROE, while noting the comparatively lower impact of other variables.

4.4 Comparing the Results with Previous Studies

The main results of the current study showed no effect of corporate governances and tax avoidance on firms' value. These findings are inconsistent with those of previous studies [6, 15, 19, 28] which found significant effect of corporate governance and tax avoidance on firm's value. Guedrib and Marouani [15] found that tax avoidance lowers a company's worth when it is coupled with a high degree of tax risk. Afes and Jarboui [6] showed that implementing corporate governance improves a company's financial performance as determined by its return on equity. The results of

Mangoting et al. [20] study indicated that increasing company value and tax avoidance was influenced by the size of independent commissioners. Supanji et al. [28] found that the following factors affect firm value: Audit Committee, Cash Effective Rate, Managerial Ownership, Institutional Ownership, and the Proportion of Independent Commissioners.

5 Conclusions

A comprehensive analysis of the study variables was conducted using three models to study the impact of corporate governance and tax avoidance on firm value. The results of the first model indicated that the independent variables and control variables can explain about 17.8% of the variation in firm value. In addition, return on equity and leverage variables have statistically significant effect on the firm value. The results of the second model indicated that the independent variables and control variables can explain about 9.2% of the variation in firm value. In addition, the board size, firm size, and rerun on equity have a highly statistically significant effect on the firm value. The results of the third model indicated that the independent variables and control variables can explain about 16.6% of the variation in firm value. In addition, the variable return on equity has a highly significant coefficient effect on the firm value.

In conclusion, the analysis of this study demonstrates that corporate governance practices and tax avoidance strategies do not have powerful drivers of firm value in Jordanian industries and services. However, the complex nature of firm value requires further exploration of additional factors that contribute to its dynamics. These findings have profound implications for companies seeking to strengthen their corporate governance frameworks and improve their tax strategies, ultimately leading to increased firm value and competitiveness in the Jordanian market.

Based on the study results, companies should strengthen their corporate governance practices, including board structures and audit committees, to positively impact firm value. In addition, Jordanian companies should implement effective tax planning strategies to manage tax liabilities and capitalize on legal tax-saving opportunities, which can boost firm value.

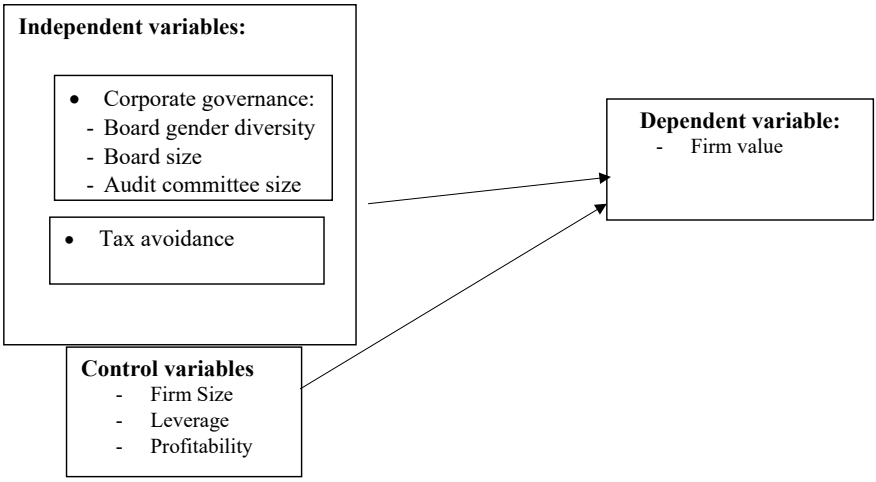


Fig. 1 Conceptual model of the study

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Board of Directors' Attributes and Quality of Sustainability Reports Among Industrial Companies and Banks Listed on a Stock Exchange



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Abstract The study's objective was to investigate the effects of board attributes on sustainability reporting in 18 banks and industrial enterprises listed on the Palestine Stock Exchange between 2013 and 2022. The study employed Linear Regression Analysis to select between the fixed regression model and the random regression model based on the *p*-value, as well as Descriptive Statistics for each variable and the Correlation Coefficient for the strength of the associations between the variables. We employed randomization if the percentage is more than five percent. R corn 4.1.1. The study found that the size of the board of directors and gender diversity are significant factors in the caliber of sustainability reports, and that the CEO's independence and dual personality have a detrimental impact on the caliber of sustainability reports. The study made the following recommendations for the Board of Directors: it should be larger, more diversified, and comprise non-executives. It is also advised that banks and businesses in the industrial sector reveal the level of their CSR and show more concern for the environment and human resources.

Keywords Board of directors characteristics · Quality of sustainability reports · Corporate social responsibility · Agency theory · Resource dependence theory

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1 Introduction

Sustainability disclosures are becoming increasingly important in developing countries as governments recognize social and environmental issues and investors' interest in transparency increases [1, 2]. Establishing internal control systems and maintaining efficient stakeholder communication are critical tasks for the board of directors, and a diverse board improves the caliber of decision-making [3–5]. Gender diversity on corporate boards significantly influences firms' sustainability engagement, as evidenced by recent literature [6, 7]. Even one female board member can improve a company's social responsibility, particularly in settings where men predominate [8]. In addition to bringing more diversified skills and experience to the board, the size of the board of directors has a significant impact on the company's operations, management, and ability to fulfill strategic goals related to sustainable development [5, 9], which is one of the main drivers of its effectiveness [10], Furthermore, independent directors possess unique incentives and values in contrast to executive directors, who typically prioritize short-term objectives. While independent directors do not take part in the company's production or operations and instead seek to enhance the decision-making process, executive directors are directly involved in these activities and their choices are frequently impacted by their administrative roles within the organization. Regarding the Board of Directors, considering their autonomy [11–13]. Being the CEO and chairman at the same time creates a conflict in leadership and governance [14].

The industrial sector contributes significantly to economic development by providing employment opportunities, increasing productivity and exports [15]. Financial institutions, especially banks, also play a key role in influencing corporate social responsibility across all industries by improving corporate governance, transparency, and disclosure [16]

The board of directors plays a crucial role in leading businesses [17, 18], yet it is frequently blamed for oversight shortcomings and corporate missteps that reduce shareholder value [19]. Businesses aim to strike a balance between sustainability and financial performance, putting long-term expansion ahead of immediate profits [20]. Public enterprises are essential to sustainable development and resource utilisation in Palestine; nevertheless, despite their ability to alleviate poverty and economic issues, there is a dearth of study on corporate social responsibility (CSR) in contested locations such as Palestine [21].

Sustainability reports are essential resources for promoting communication between businesses and a wide range of stakeholders, such as government agencies, communities, suppliers, employees, shareholders, and investors. These reports emphasize responsibility and transparency by providing insightful information about how businesses handle sustainability issues, contribute value, and reduce risks. Sustainability reports are essential for the Board of Directors because they keep an eye on management procedures, assess business performance, and direct strategic decision-making. Boards can assure long-term sustainability, improve company

governance, and increase competitiveness in the market by utilizing the information found in sustainability reports.

Our study, which is unique in that it focuses on revealing the quality of corporate social responsibility in addition to levels, by including pictures, numbers, and graphics, aims to analyse the impact of board characteristics on the quality of sustainability reports in industrial companies and banks listed on the Palestine Stock Exchange from 2013 to 2022. It also concentrated on assessing how board composition affects CSR issues (environment, human resources, employees, and products).

2 Theoretical Background, Literature Review and Hypotheses Development

Sustainability reports foster communication between companies and stakeholders, promoting transparency and accountability. They help stakeholders understand a company's sustainability efforts and value creation while managing risks. For the board of directors, sustainability reporting is crucial for overseeing management behavior and evaluating performance, ensuring effective guidance. Sustainability reporting involves measuring, disclosing, and evaluating organizational efforts to achieve sustainable development goals [2]. Agency theory states that by regulating managers' behaviour, independent board members can improve board oversight and lower agency costs [22, 23] In order to attain competitive excellence and continual development, boards must balance economic, social, and environmental objectives. Resource dependence theory highlights the significance of management boards' competencies in promoting sustainability [24].

2.1 Gender Diversity

Gender diversity on corporate boards is crucial for addressing sustainability issues and enhancing management effectiveness, according to recent studies. Theoretical frameworks including as resource dependence theory and stakeholder theory encourage the participation of women on boards, and research suggests that the diversity of their perspectives improves decision-making [25]. Research indicates that organisations with a higher proportion of female board members typically exhibit superior stakeholder management, community involvement, and philanthropic endeavors [26]. Furthermore, there is a correlation between higher female representation and a higher probability of generating integrated sustainability reports [27]. Although this topic has received more attention from developed nations, research shows that sustainable practices and board gender diversity are positively correlated in both developed and emerging markets [28]. Research from Asia, Africa,

and Europe in particular has shown that corporations with larger percentages of female board members typically have more robust environmental, social, and governance (ESG) disclosures [29, 30]. To completely comprehend the mechanisms underlying these links and their consequences for corporate governance and sustainability, more research is necessary, even in light of the increased focus and data supporting these relationships. Based on the above theoretical and empirical arguments, we hypothesize that:

H1: There is a positive correlation between Board Gender Diversity and the Quality of Sustainability Reports.

2.2 Board Size

The total number of board members who are employed by a specific corporation is known as the board size. In terms of financial knowledge and problem-solving abilities, boards typically contain a wider range of backgrounds, which benefits the company's reputation and image [31]. The quality of sustainability reporting is positively correlated with board size, as repeatedly shown by recent study. Research by [32–36] all demonstrate that stronger sustainability reporting and larger boards are positively correlated. According to agency theory, corporations in Malaysia that have a larger board have better sustainability disclosure [37]. In a similar vein, [38] found that bigger boards improve disclosures about sustainability in Pakistani businesses. Additionally, [39] discovered a statistically significant and favorable correlation between board size and sustainability reporting. Additionally, [40] emphasized how important board size is to enhancing sustainability reporting for Nigerian listed non-financial companies. Based on the above theoretical and empirical arguments, we hypothesize that:

H2: There is a positive correlation between Board Size and the Quality of Sustainability Reports.

2.3 Board Independence

For the Board of Directors to effectively oversee the agent and internal operations, independence is essential. By making sure there are an adequate number of independent directors, this is accomplished [41]. Board independence and sustainability reporting are positively correlated, according to recent studies. Research [27] found that, among 134 multinational corporations, board independence was positively correlated with integrated reporting quality. After examining 88 South Asian listed businesses, Abdelhaq et al. [42] came to the conclusion that board independence has a big impact on environmental sustainability reporting. In a similar vein, Amer

et al. [43] highlighted how important board independence is to encouraging sustainability reporting among 176 Latin American publicly traded companies. Furthermore, Githaiga and Kosgei [31] demonstrated that independence, financial know-how, and gender diversity on boards have a favorable effect on sustainability reporting in East African listed businesses. These results were corroborated by study [40], which showed that board independence improves sustainability reporting for Nigerian listed non-financial enterprises. Based on the above theoretical and empirical arguments, we hypothesize that:

H3: There is a positive correlation between Board Independence and the Quality of Sustainability Reports.

2.4 CEO Duality

CEO duality, in which a single individual serves as both the chairman and the CEO at the same time, facilitates executive authority coherence and expeditious decision-making, which benefits businesses in critical business situations [44]. This arrangement makes it easier for management and the board to communicate effectively since the CEO can use their power to improve performance and reveal pertinent information [39]. When considering CEO duality from the perspective of agency theory, profit maximization may take precedence over CSR activities [35]. Research by [43, 45] discovered inverse relationships between CEO duality and ESG disclosure in publicly traded firms, indicating that centralized authority may obstruct efficient governance and decision-making, resulting in disputes and eroding the legitimacy of corporate governance frameworks. Based on the above theoretical and empirical arguments, we hypothesize that:

H4: There is a negative correlation between Board CEO Duality and the Quality of Sustainability Reports.

3 Methodology

3.1 Population and Sample

From 2013 to 2022, banks and industrial enterprises registered on the Palestine Stock Exchange made up the study population. The sample comprises companies that satisfy multiple requirements, of which:

First, being listed on the Palestine Stock Exchange.

Second, being listed within the specified timeframe.

These requirements led to the inclusion of 18 banks and industrial enterprises in the sample. Comprising seven of the eight banks and eleven industrial enterprises; Al Safa Bank was left out in because it was listed in 2022.The study focused on the industrial sector and banks because they represent an important sector in Palestine, as they are considered among the emerging Palestinian sectors that affect the state's economy.

3.2 Variable Measurement

The Dependent Variable: Quality of Sustainability Reporting

Measuring, revealing, and holding organizations responsible for their efforts toward attaining sustainable development goals are all part of sustainability reporting [2].

The study [46] provided the baseline for the corporate social responsibility levels used to judge the quality of sustainability reports, which were then adjusted to fit the study's sample. The measurement of corporate social responsibility involves examining the information contained in the financial reports of banks and industrial enterprises. A score of 1 indicates the presence of CSR, while a score of 0 indicates its absence.

$$\text{CSR-Level} = \sum \text{Employee, Product, Environment, and Community Points}/30.$$

Independent Variables

Four independent variables were employed in the study: Gender Diversity, Board Size, Independence, and CEO Duality. Moreover, four control variables were employed: Leverage, Profitability, Firm Size, and Firm Age.

The operational definitions of dependent, independent, and control variables are given in Table 1.

3.3 The Regression Model

The following multiple regression model was created in order to investigate the effects of board of directors characteristics on the quality of sustainability reports in banks and industrial enterprises listed on the Palestine Stock Exchange between 2013 and 2022:

$$CSR - L = \alpha i + \beta 1BGD + \beta 2BSIZE + \beta 3BIND + \beta 4CEO + \beta 5LEV + \beta 6PROF + \beta 7SIZE\,F + \beta 8AGE + \varepsilon it$$

Table 1 Measurement of variables

Variable	Label	The definition	Operational definition	References
Corporate social responsibility-level	CSR-L	Ability to manage operations efficiently and achieve profitability, leading to business sustainability and effective achievement of financial goals [46]	$\sum$ Points of (community, environment, employee, and product)/30	[46]
Gender diversity	BGD	A certain proportion of women must be on the board of directors [47]	The proportion of female directors	[31]
Board size	BSIZE	The board size represents the total number of individuals serving as board members within a specific company [31]	The number of board members	[31, 48]
Independence	BIND	The board is composed of several independent directors [31]	The ratio of independent directors to the total number of directors on the board	[49]
CEO duality	CEO	Means that the CEO also serves as the chairman of the board [48]	Converted the variable to a binary representation, where "0" means that the CEO is not the chairman and "1" indicates that they are	[39, 48]
Leverage	LEV	The debt-to-assets ratio measures how much of a company's assets are financed by debt. It is computed by dividing total liabilities by total assets. This metric assesses a company's reliance on borrowed capital or leverage [50]	Total liabilities to total assets	[51, 52]
Profitability	PROF	The profits a company achieves from revenues after deducting all costs and expenses observed during a certain period	Net income divided by total assets is the return on asset equation	[51]

(continued)

Table 1 (continued)

Variable	Label	The definition	Operational definition	References
Firm Size	SIZE	Typically, a company's capitalization, total assets owned, and total sales generated all indicate its size	The asset total log at the conclusion of the period	[39]
Firm Age	AGE	The period during which the company exists and is active in the market	Number of years passed since listing	[53]

Source Developed by authors

3.4 Additional Analysis

Two further metrics were included in the study: In the first research, the quality of corporate social responsibility was ranked from 0 to 6 based on the board of directors' qualities, as determined by looking at numbers and photos [8].

0: No information disclosed, 1: An item's general disclosure; 2: Items referenced in general disclosures that have accompanying photos; 3: are descriptive and qualitative disclosures that provide clear and precise details; 4: are mostly qualitative and descriptive disclosures that include supporting images or diagrams; 5: are digital disclosures or disclosures that include numerical data; and 6: are full digital disclosures that include pictures or graphs.

The impact of the board of directors' attributes on the CSR items of environment, human resources, society, and product is the subject of the second examination.

4 Result and Discussion

4.1 Descriptive Statistics

Table 2 presents the findings of the descriptive statistical analysis of the study variables, which comprise the dependent, independent, and control variables Together with the other analytical variables that were examined in the study:

Table 2 shows the descriptive statistical analysis that industrial companies and banks listed on the Palestine Stock Exchange generally disclose their CSR levels, with an average CSR-L of 0.55 ($p = 0.90$d). However, there is a need to improve the detection of CSR-Q, which is indicated by the lower average CSR-Q of 0.18 ($p = 0.99$d), which is equivalent to 3%. Regarding items of CSR, (ENV) is lower (mean = 0.28), while disclosures related to (HR), (CI), and (PRO) are relatively higher. (BGD) is low (0.08), with the average percentage of female board members being around 9%, which is below corporate governance requirements. Most board

Table 2 Descriptive statistical analysis

Variable	Mean	Std. Dev	Min	Max
CSR-L	0.55	0.18	0.2	0.93
CSR-Q	0.18	0.12	0.03	0.71
ENV	0.28	0.28	0	0.89
HR	0.57	0.2	0.1	1
CI	0.78	0.27	0	1
PRO	0.71	0.27	0	1
BGD	0.08	0.11	0	0.45
BSIZE	8.92	2.16	4	14
BIND	0.39	0.11	0.6	1
CEO	0.14	0.35	0	1
LEV	0.44	0.27	0.06	0.93
PRO	0.04	0.08	− 0.62	0.27
SIZE	555,442,870.18	1,156,879,385.1	760,584	6,508,221,806
AGE	14.4	6.24	0	25

members are independent (mean = 0.93) and non-executive (mean = 0.14). Firms tend to rely on equity (mean leverage = 0.44) and show low profitability (mean = 0.04). In addition, the average size and age of firms are 555, 442, 870.15 and 14.4, respectively.

4.2 Correlation Coefficient

The associations between independent and control factors and the dependent variables (CSR-L and CSR-Q) and CSR-L items in banks and industrial enterprises listed on the Palestine Stock Exchange were examined using the Pearson correlation coefficients in Table 3. There appears to be no problem with multicollinearity among the research variables, as indicated by the maximum correlation coefficient value of 0.47, which indicates that correlations between independent variables usually fall below 0.7.This makes it possible to assess the importance of each variable and how it affects the dependent variable's prediction.

The variables BGD, BSIZE, BIND, LEV, PROF, and SIZE have a positive correlation with CSR-L, while the variables CEO and AGE have a negative correlation with CSR-L.

BGD, BSIZE, BIND, and SIZE have a positive correlation with CSR-Q. Additionally, there is a negative correlation between CSR-Q and (CEO, LEV, PROF, AGE).

Table 3 Correlation Coefficient Analysis for industrial companies and banks

	CSR.L	CSR.Q	ENV	HR	CI	PRO	BGD	BSIZE	BIND	CEO	LEV	PROF	SIZE	AGE
CSR.L	1	0.78 (< 0.001)	0.78 (< 0.001)	0.79 (< 0.001)	0.61 (< 0.001)	0.66 (< 0.001)	0.29 (< 0.001)	0.38 (< 0.001)	0.16 (0.03)	− 0.05 (0.526)	0.13 (0.09)	0.07 (0.33)	0.47 (< 0.001)	− 0.26 (< 0.001)
CSR.Q		1	0.65 (< 0.001)	0.62 (< 0.001)	0.47 (< 0.001)	0.46 (< 0.001)	0.01 (0.874)	0.43 (< 0.001)	0.16 (0.032)	− 0.1 (0.169)	− 0.03 (0.727)	− 0.01 (0.898)	0.29 (< 0.001)	− 0.09 (0.227)
ENV			1	0.46 (< 0.001)	0.25 (0.001)	0.31 (< 0.001)	0.16 (0.031)	0.15 (0.048)	0.2 (0.008)	− 0.13 (0.08)	− 0.02 (0.824)	0.05 (0.51)	0.35 (< 0.001)	− 0.34 (< 0.001)
HR				1	0.31 (< 0.001)	0.45 (< 0.001)	0.12 (0.108)	0.33 (< 0.001)	0.08 (0.26)	− 0.03 (0.68)	0.19 (0.013)	− 0.17 (0.024)	0.38 (< 0.001)	− 0.35 (< 0.001)
CI					1	0.37 (< 0.001)	0.16 (0.03)	0.41 (< 0.001)	− 0.15 (0.046)	0.29 (< 0.001)	0.02 (0.838)	0.19 (0.01)	0.28 (< 0.001)	0.13 (0.08)
PRO						1	0.47 (< 0.001)	0.31 (< 0.001)	0.39 (< 0.001)	− 0.25 (0.001)	0.25 (0.001)	0.19 (0.011)	0.36 (< 0.001)	0.05 (0.501)
BGD							1	− 0.02 (0.74)	0.11 (0.142)	− 0.18 (0.013)	0.25 (0.001)	0.19 (0.011)	0.42 (< 0.001)	0.06 (0.432)
BSIZE								1	0.16 (0.038)	0.05 (0.544)	0.47 (< 0.001)	− 0.28 (< 0.001)	0.4 (< 0.001)	0.2 (0.006)
BIND									1	− 0.65 (< 0.001)	0.21 (0.004)	− 0.12 (0.113)	0.23 (0.002)	− 0.03 (0.661)
CEO										1	0.02 (0.74)	0.02 (0.773)	0.05 (0.467)	0.08 (0.301)
LEV											1	− 0.37 (< 0.001)	0.59 (< 0.001)	0.17 (0.025)
PROF												1	− 0.16 (0.029)	0.08 (0.261)

(continued)

Table 3 (continued)

	CSR.L	CSR.Q	ENV	HR	CI	PRO	BGD	BSIZE	BIND	CEO	LEV	PROF	SIZE	AGE
SIZE													1	0.05 (0.529)
AGE														1

Notes *Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)

The correlation between ENV (CSR-L) and (BGD, BSIZE, BIND, PROF, and SIZE) is positive. Additionally, there is a negative correlation between ENV (CSR-L) and (CEO, LEV, and AGE).

The correlation between HR (CSR-L) and (BGD, BSIZE, BIND, LEV, and SIZE) is positive. Additionally, there is a bad correlation between HR (CSR-L) and (CEO, PROF, and AGE).

(BGD, BSIZE, CEO, LEV, PROF, SIZE, and AGE) and CI (CSR-L) have a positive correlation. Moreover, BIND and CI have a negative association (CSR-L).

4.3 Regression Analysis

The effect of independent variables (BGD, BSIZE, BIND, CEO) and control factors (LEV, PROF, SIZE, AGE) on the dependent variable (CSR-L) was determined in this section using a panel linear regression model (fixed effects model and random effects model). The best model was then chosen using the Hausman test. Thus, we employ a fixed effects model otherwise, and a random effects model if the Hausman test value is $p > 0.05$. However, when employing VIF, no collinearity issues were discovered [54–56].

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.159$).

The results of a linear regression study performed on banks and industrial enterprises listed on the Palestine Stock Exchange are presented in Table 4. First, the first hypothesis is supported by a substantial positive effect (0.483, $p < 0.001$) between the percentage of females on boards of directors (BG) and (CSR-L). Second, prior research has shown that (BSIZE) positively affects CSR-L (0.008, $p = 0.221$), as reported in papers like [36, 42]. The adverse impact of BIND on CSR-L (-0.112, $p = 0.388$) defies agency theory and certain research [27]. The CEO's detrimental effect on CSR-L (-0.039, $p = 0.322$) is consistent with earlier studies [36], stating that when the CEO is also the chairman, profit maximization should take precedence above social considerations. Furthermore, CSR-L is significantly impacted negatively by (LEV) (-0.229, $p < 0.001$), but positively by (PROF) and (SIZE) (0.027, $p = 0.841$ and 0.058, $p < 0.001$, respectively). Lastly, (AGE) has a negative relationship with CSR-L (-0.011, $p < 0.001$), suggesting that recently listed businesses put profits before social responsibility.

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.279$).

Table 5 displays the results of a linear regression analysis carried out on Palestine Stock Exchange-listed companies, which indicated multiple noteworthy correlations with (CSR-Q). Between BGD and CSR-Q, there is a positive effect of 0.042 ($p = 0.553$). Greater transparency is typically associated with larger boards, which is

Table 4 LR analysis between CSR.L and other variables

Fixed effect model					Random effect model					
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Hausman test	VIF
BGD	0.474	0.094	< 0.001	0.606/ 0.564	0.483	0.095	< 0.001*	0.606/ 0.564	0.159	1.27
BSIZE	0.01	0.007	0.152		0.008	0.007	0.221***			2.59
BIND	− 0.067	0.13	0.605		− 0.112	0.13	0.388***			2.42
CEO	− 0.021	0.04	0.604		− 0.039	0.04	0.322***			2.35
LEV	− 0.223	0.048	< 0.001		− 0.229	0.048	< 0.001*			2.13
PROF	0.037	0.132	0.781		0.027	0.133	0.841***			1.51
SIZE	0.056	0.008	< 0.001		0.058	0.008	< 0.001*			3.53
AGE	− 0.013	0.002	< 0.001		− 0.011	0.002	< 0.001*			1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 1 >> formula = CSR.L ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

consistent with agency theory's emphasis on increased monitoring capability translating into increasing responsibility. BIND, however, revealed a negative effect that might have been influenced by variables outside the purview of the study, including social interactions or control relationships. The claim that agency expenses can be reduced by keeping the functions of CEO and board chairman distinct is supported by the substantial negative impact of the CEO. Furthermore, leverage showed a strong negative correlation, suggesting that when debt levels rise, businesses become less likely to take responsibility because of the increased dangers. Although not statistically significant, PROF revealed a negative effect that could have an impact on CSR-Q. On the other hand, AGE significantly lowered CSR-Q, whereas SIZE significantly increased it.

We chose to interpret the Fixed effects model based on the p-value of the Hausman test ($p = 0.001$).

The environment (CSR-L item) and other variables in industrial enterprises and banks listed on the Palestine Stock Exchange are analyzed using linear regression, as presented in Table 6.

The CSR-L items show a positive correlation of 0.447 ($p = 0.009$) between BGD and ENV. BSIZE has a positive impact on ENV (CSR-L items) of 0.004 ($p = 0.72$). BIND positively affects ENV (CSR-L items) by 0.228 ($p = 0.223$). BIND has a 0.027 favorable impact on ENV (CSR-L items).

Between LEV and ENV (CSR-L items), there is a significant negative effect of − 0.297 ($p = 0.001$).PROF and ENV (CSR-L items) have a negative relationship of − 0.041 ($p = 0.955$). SIZE and ENV (CSR-L items) had a significant positive influence of 0.053 ($p < 0.001$). Showing a statistically significant negative correlation between AGE and ENV (CSR-L items) of − 0.023 ($p < 0.001$).

Table 5 LR analysis between CSR.Q and other variables

Fixed Effects					Random Effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	phtest	VIF
BGD	0.035	0.071	0.622	0.481/ 0.426	0.042	0.071	0.553***	0.481/ 0.426	0.279	1.27
BSIZE	0.01	0.005	0.043		0.009	0.005	0.072**			2.59
BIND	− 0.077	0.098	0.433		− 0.121	0.098	0.217***			2.41
CEO	− 0.061	0.03	0.044		− 0.079	0.03	0.008**			2.35
LEV	− 0.237	0.036	< 0.001		− 0.242	0.036	< 0.001*			2.12
PROF	− 0.135	0.1	0.181		− 0.141	0.1	0.161***			1.51
SIZE	0.038	0.006	< 0.001		0.04	0.006	< 0.001*			3.53
AGE	− 0.004	0.001	0.001		− 0.003	0.001	0.021**			1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 2 >> formula = CSR.Q ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Table 6 LR analysis between ENV (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.435	0.169	0.011	0.443/ 0.384	0.447	0.172	0.009*	0.443/ 0.384	0.001	1.27
BSIZE	0.006	0.012	0.601		0.004	0.012	0.72***			2.59
BIND	0.354	0.233	0.132		0.288	0.236	0.223***			2.41
CEO	0.027	0.072	0.711		0	0.073	0.998***			2.35
LEV	− 0.288	0.086	0.001		− 0.297	0.087	0.001*			2.12
PROF	− 0.006	0.239	0.979		− 0.014	0.242	0.955**			1.51
SIZE	0.05	0.014	< 0.001		0.053	0.014	< 0.001*			3.53
AGE	− 0.025	0.003	< 0.001		− 0.023	0.003	< 0.001*			1.11

Notes * Significant at the 0.01 level (two-tailed); ** significant at the 0.05 level (two-tailed); *** significant at the 0.10 level (two-tailed)
Mode 3 >> formula = ENV ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.209$).

The linear regression analysis of human resources (CSR-L item) and other variables in banks and industrial enterprises listed on the Palestine Stock Exchange is presented in Table 7.

Table 7 LR analysis between HR (CSR-L items) and others varibles

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.23	0.113	0.044	0.509/ 0.456	0.241	0.114	0.035**	0.509/ 0.456	0.209	1.27
BSIZE	0	0.008	0.999		− 0.001	0.008	0.889***	0.509/ 0.456		2.59
BIND	− 0.35	0.156	0.027		− 0.395	0.157	0.012*	0.509/ 0.456		2.41
CEO	− 0.078	0.048	0.109		− 0.096	0.048	0.045***	0.509/ 0.456		2.35
LEV	− 0.14	0.057	0.016		− 0.146	0.058	0.012*	0.509/ 0.456		2.12
PROF	− 0.454	0.16	0.005		− 0.46	0.161	0.004*	0.509/ 0.456		1.51
SIZE	0.058	0.009	< 0.001		0.06	0.009	< 0.001*	0.509/ 0.456		3.53
AGE	− 0.016	0.002	< 0.001		− 0.014	0.002	< 0.001*	0.509/ 0.456		1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 4 >> formula = HR ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Between BGD and HR, there is a statistically significant positive effect of 0.241 ($p = 0.035$) (CSR-L items). HR (CSR-L items) is negatively impacted by BSIZE by − 0.001 ($p = 0.889$). BIND significantly reduces HR (CSR-L items) by − 0.395 ($p = 0.012$). Between the CEO and HR (CSR-L items), there is a substantial positive effect of − 0.096($p = 0.045$).

Between LEV and HR (CSR-L items), there is a significant negative effect of − 0.146($p = 0.012$).

PROF and HR (CSR-L items) have a significant negative influence of − 0.046 ($p = 0.004$). SIZE and HR (CSR-L items) had a significant positive influence of 0.053 ($p < 0.001$). Showing a statistically significant negative correlation between AGE and HR (CSR-L items) of − 0.014 ($p < 0.001$).

We chose to interpret the Random effects model based on the *p*-value of the Hausman test ($p = 0.941$).

The linear regression study between the society (CSR-L item) and other variables in the banks and industrial enterprises listed on the Palestine Stock Exchange is displayed in Table 8.

Table 8 LR analysis between CI (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.52	0.153	0.001	0.547/ 0.499	0.51	0.153	0.001*	0.547/ 0.499	0.941	1.27
BSIZE	0.029	0.011	0.01		0.031	0.011	0.006*			2.59
BIND	− 0.49	0.211	0.021		− 0.406	0.21	0.053**			2.41
CEO	0.084	0.065	0.199		0.114	0.064	0.076***			2.35
LEV	− 0.454	0.077	< 0.001		− 0.449	0.078	< 0.001*			2.12
PROF	0.312	0.215	0.15		0.298	0.216	0.167***			1.51
SIZE	0.076	0.012	< 0.001		0.073	0.012	< 0.001*			3.53
AGE	0.005	0.003	0.061		0.002	0.003	0.337***			1.11

Notes * Significant at the 0.01 level (two-tailed); ** significant at the 0.05 level (two-tailed); *** significant at the 0.10 level (two-tailed)
Mode 5 >> formula = CI ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Between BGD and CI, there is a statistically significant positive effect of 0.51 ($p = 0.001$) (CSR-L item). There is a positive relationship between CEO and CI (CSR-L item), a negative effect between BIND and CI (CSR-L item), and a substantial positive effect of 0.031($p = 0.006$) on CI (CSR-L item) according to BSIZE.

Between LEV and CI (CSR-L item), there is a significant negative effect of − 0.449($p < 0.001$), a positive effect of 0.298 ($p = 0.167$) from PROF on CI (CSR-L item), a substantial positive effect of 0.073 ($p < 0.001$) from SIZE on CI (CSR-L item), and a positive effect of 0.002 ($p = 0.337$) from AGE on CI (CSR-L item).

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.209$).

The linear regression analysis of Product (CSR-L item) and other variables in banks and industrial enterprises listed on the Palestine Stock Exchange is presented in Table 9.

BGD and PRO (CSR-L item) have a substantial positive effect of 0.927 ($p < 0.001$), while BSIZE and PRO (CSR-L item) have a positive effect of 0.016 ($p = 0.154$). BIND has a positive effect of 0.465 ($p = 0.026$) on PRO (CSR-L item), while CEO has a negative effect of − 0.076 ($p = 0.235$) on PRO (CSR-L item).

LEV has a significant positive effect of 0.617 ($p = 0.004$) between PROF and PRO (CSR-L item), and a negative effect of –0.067 ($p = 0.388$) on PRO(CSR-L item). On PRO (CSR-L item), SIZE has a substantial positive impact of 0.04 ($p = 0.001$), while AGE has a negative impact of − 0.002 ($p = 0.494$) on PRO.

Table 9 LR analysis between PRO (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.935	0.157	< 0.001	0.494/ 0.44	0.927	0.153	< 0.001*	0.494/ 0.44	1	1.27
BSIZE	0.015	0.011	0.18		0.016	0.011	0.154***	0.494/ 0.44		2.59
BIND	0.447	0.217	0.041		0.465	0.209	0.026*	0.494/ 0.44		2.41
CEO	− 0.083	0.067	0.213		− 0.076	0.064	0.235***	0.494/ 0.44		2.35
LEV	− 0.07	0.08	0.381		− 0.067	0.078	0.388***	0.494/ 0.44		2.12
PROF	0.618	0.222	0.006		0.617	0.215	0.004*	0.494/ 0.44		1.51
SIZE	0.041	0.013	0.002		0.04	0.012	0.001*	0.494/ 0.44		3.53

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 6 >> formula = PRO ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

5 Conclusion

The purpose of the study was to look into how the qualities of the board of directors affected the caliber of sustainability reports from 2013 to 2022, as determined by the levels of corporate social responsibility. It was discovered that banks and industrial enterprises in Palestine prefer revealing CSR levels over quality, with averages of 0.18, or 3%, for quality and 55% for CSR levels. Among the most significant findings are that gender diversity positively influences the quality of sustainability reports, which is consistent with many studies, including the study [28]. Increasing the representation of women on boards of directors can improve sustainability practices and effectively meet stakeholder needs. The study also focuses on societal aspects, productivity, human resources, and the environment. The Study's [30] findings corroborate the idea that gender diversity improves boards of directors' oversight capabilities. Second, it showed that since larger boards of directors include a wider range of backgrounds and expertise, the size of the board positively affects the caliber of sustainability reports. Third: We disregarded the third hypothesis since the evidence showed that independence had a detrimental effect on sustainability reports' quality. This was explained by the existence of unaccounted-for determinants of independence, such as accounting expertise. Furthermore, the credibility and impartiality of a report may suffer when it lacks independence, and the data it contains may be skewed by prejudices, special interests, or other forms of manipulation. As a result, reports lose some of their credibility and usefulness as instruments

Table 10 Results

Hypothesis number	Hypotheses	Result
1	There is a positive correlation between Board Gender Diversity and the Quality of Sustainability Reports	Supported
2	There is a positive correlation between The size of the Board and the Quality of Sustainability Reports	Supported
3	There is a positive correlation between Independence and the Quality of Sustainability Reports	Rejected
4	There is a negative correlation between CEO Duality and the Quality of Sustainability Reports	Supported

Source Developed by authors

for gauging sustainability. As a result, independence is seen as a crucial component in guaranteeing the caliber of sustainability reports and upholding their legitimacy and openness. Agency theory, which states that independent board members improve board monitoring and lower agency expenses, is in conflict with this. Numerous investigations, including studies [43], refute this. In conclusion, the study revealed that the CEO's duality has a negative impact on sustainability report quality when there is a conflict between the CEO and the Chairman of the Board of Directors. This could potentially impact the level of objectivity in reporting, which is in line with other research, such as study [45], which found that it was detrimental to use one person's strength to undermine both positions. The Board of Directors makes decision-making difficult and raises the possibility of executive remuneration conflicts and improper use of corporate governance procedures. Increasing the number of women appointed to the board, increasing its size, and designating non-executive directors were among the proposals. The report also recommended broadening the definition of corporate social responsibility disclosure to include figures, photographs, and graphics as well as paying more attention to environmental and human resource concerns by following environmental regulations and raising funds. The study was constrained in that it only examined a small number of dependent and variable variables, as well as concentrating on two sectors of the Palestinian society: banks and industrial enterprises. Future studies could look into other attributes of the board and different metrics for evaluating the quality of sustainability reports, like the Global Reporting Initiative. They could also use data from other industries, including services or enterprises operating in comparable settings (Table 10).

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Driving Customer Satisfaction: Exploring the Impact of Digital Banking Transformation in Banks



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Abstract The main findings of the study showed that mobile banking has a significantly positive impact on improving customer satisfaction. This impact was measured by the overall score from the customers' point of view (3.72). This shows that the level of appreciation is high, and the highest average was for the "Digital Interaction" field, where it received 3.97. The lowest average was for the "User Experience" field, which obtained (3.47) reflecting the opinion of customers about the effectiveness and quality of mobile banking services. which suggests a high level of estimation. The study presented several important recommendations, including banks must continue to enhance the provision of online banking services to ensure customer satisfaction. The design of the bank's application should be appropriate and easy to use. Educate customers that using services Online banking is safe, and they can train customers on that.

Keywords Digital banking transformation · Customer service · Online banking

1 Introduction

With the rapid technological development that we live in our world, which has led to digital transformation and development in financial institutions, where the application of digital technology works to intelligently exploit data to improve operations and provide financial services more efficiently and innovatively, digital transformation is considered a relatively recent term in the banking sector, It represents a modern and decisive challenge in the development of the banking sector and represents tremendous opportunities to improve banking services and better meet customer needs [1]. The change in banking operation activities efficiently without increasing the number

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of branches to serve customer remotely which reflect cost reduction however the importance of security levels, risk, ease of use, public awareness are main factors affect the digital banking transformation process [2].

In the fourth industrial revolution in the event of covide 19 pandemic most customers satisfied with digital transformation as well bank employees agree to take this initiative of development [3]. Corona pandemic imposed many global challenges, such as imposing closures and preventing movement. As a result of these challenges, the pandemic contributed to accelerating innovation and finding quick digital solutions, which contributed to increasing the use of modern technology in all its forms, which prompted banks to develop modern and advanced methods that suit the market's need [4].

The remarkable technological development in recent years has led to the occurrence of a new phenomenon called (the digital economy), which refers to the transformations taking place in financial institutions, and global analyzes indicate the great potential for the growth of digital financial services, but with the establishment of the necessary foundations and rules to regulate its development. To gain a competitive advantage, companies must focus on the role of the customer, his experience, and the provision of innovative digital services.

According to The Palestinian Central Bureau of Statistics 80% of Palestinians have access to the Internet in the West Bank and Gaza Strip, it is enjoying good growth, technology sector companies. Abu Mansour [5], There are (13) banks were licensed by Palestinian Monetary Authority (PMA) including (7) local banks and (6) foreign banks, operating through (245) branches, (89) offices and 39 cash offices [6], we can consider the market is monopolistic competitive due to many banks operating however, With the aim of improving the customer experience We must deepen understanding of their needs, interests, and preferences for the products provided to them because this helps raise and improve the level of services provided to them, thus raising the competitive value of the bank and attracting more new customers [7].

Customer satisfaction has been defined as the feeling of the consumer after using the product or providing the service to him, and the feeling of satisfaction leads to loyalty and increasing the company's reputation in the market in addition to spreading positive word of mouth among people, so companies aim to provide the best services to ensure customer satisfaction, and on the contrary, the gap Between what the customer expects and what he gets. Customers in banks provide an evaluation of the quality of services based on five dimensions which are reliability, tangibles, responsiveness, assurance and empathy) [8]. Banks provide advanced and diverse technological banking services in order to attract the largest possible number of customers by allocating bank resources towards trust and privacy and paying greater attention to them, which will reflect positively on performance, create great confidence and greater security for customers in their online uses, and remind them to constantly protect their privacy and secure financial information [9].

Due to the continuous technological developments, banks are forced to continue providing their banking services in an advanced digital manner. Therefore, banks are considered one of the sectors that spend heavily on technological investments, such as online banking applications, which include several services such as digital payment, digital stores, electronic signature, etc., and it has great benefits for customers, such as saving time and effort, easy access to banking information and knowing exactly what was spent through the bank, in addition to enabling residents of remote areas to access electronic banking services easily [10]. The study deals with seeing the impact of the digital transformation of Palestinian banks on customer satisfaction, the study was determined to measure the following variables: (Usefulness Mobile applications, Accessibility, security, user experience, digital interaction).

1.1 Problem Statement

The research problem arises as a result of confirming the importance of the impact of digital transformation, the research will provide insights about these questions what is the effect of mobile banking on improving customer satisfaction measured by banks embrace digital transformation, accessibility of services, security available in banking services, the usefulness mobile applications, user experience and digital interaction according to customers' point of view? Are there statistical differences in the response's degree of the customers' point of view about according to the variables of gender and qualification?

1.2 Objectives of the Study

The main objective of this study is to clarify the impact of digital transformation in Palestinian banks on customer service by clarifying Customers' banking experience with digital banking transformation, electronic banking services contribute to reducing time and effort for customers and Customers' fears about using electronic banks.

1.3 The Importance of the Study

The importance of this research is evident in the importance of the topic it addresses, which relates to the impact of digital transformation in Palestinian banks on improving customer service, which positively affects the development of the banking sector, improving customer satisfaction.

2 Literature Review

In recent years, research on digital transformation has increased significantly, and the terms and definitions that express it have varied, and it has been noted that there are differences [11, 12]. Digital transformation is: "something with certain characteristics; that is driven by something; to create certain impacts; on certain aspects of the organization" [13]. In the master's thesis conducted by Ditshego on banks in Africa, he showed that banks face pressures and challenges from customers due to their desire for their banking experience to be easier and simpler than it is, so banks in Africa seek to change their business models to suit customer requirements. Knowing that the general belief is that banks have enough experience and skills to transform digitally easily, in the end and at some point, they must transform digitally in order for the bank to develop, With due regard to the new business model must be based on the customer [14].

Bank of England created a study on banks' use of modern technologies, and the results were that three-quarters of banks use advanced strategies and technologies that suit the needs of the bank and its customers, but after the Corona pandemic this percentage increased [15].

Many studies investigate the determinants of user's acceptance online banking lead these factors user friendliness whereas accessibility and compatibility doesn't affect the continues of using electronic channels may be this due preliminary registration stage [16]. During the last decade, the use of modern technologies has accelerated significantly in various industries and one of the industries that has witnessed development is the financial sector with the aim of providing better services and increasing banks' profits, and thus the impact is reflected in the growth and development of the economy [17], It is important for banks to work to improve and enhance banking services as much as possible, through advertising and awareness campaigns on the importance of using electronic banking services and encouraging customers to use them by offering them a set of incentives and dispensing with traditional banking methods. It is new to mention the need to pay attention to addressing customer problems through Effective automated responses via social media or websites [18].

Investing in new systems and technologies is not limited to monetary investments only. Investment must be made in employees in terms of training them to be highly competent in dealing with the company and customers, so they are considered an important part of the digital transformation success process. With technological development, the importance of cybersecurity increases, which focuses on protecting electronic systems from expected attacks, so banks must be ready to face any challenges to maintain data security for customers [19], Digital technology has changed the business models of banks, leading to an increase in productivity which enables success and reliance on many financial matters [20].

Competition is increasing between financial institutions to search for the best and latest digital technologies to increase its value in the market [21], as a result of adopting this digital technology, businesses have been able to provide great services to their customers [22], given that all financial institutions mostly seek one goal

which is to achieve profit, competition, continuity and loyalty from customers and clients however, they differ in the way in which they achieve this goal [23].

Digital transformation in the banking sector is not an easy process, it requires restructuring part of the work, whether it is restructuring internal operations or even changing current methods. In addition, the infrastructure for banking services requires huge sums of money, but in the long run when customers get used to on digital services instead of traditional ones, the cost of resources will decrease, and the number of actual employees present in banks will decrease, and this leads to a reduction in operating costs, as it is possible for a part of the bank's employees to work remotely to monitor electronic banking operations [24]. Investing in technology and digital transformation has become a necessity to increase knowledge of customer behavior and considerations and increase profits [25], because it is the leader in the field of business, and as a result, a greater role has emerged for interacting with customers and strengthening relationships with them. Accordingly, companies must focus on the role and experience of the customer and provide innovative digital services to gain a competitive advantage [26] because the complete digital transformation of banking operations leads to raising the performance of banks and attracting the largest possible number of investments to banks [27].

The rate of use of digital transformation in Palestinian society has increased recently, and the Palestinian Ministry of Communications are giving priority to investing in the technological sector in order to improve its operations and electronic payment methods have effectively contributed to enhancing the financial performance of Palestinian banks, which has helped to reduce costs and increase bank profits [28], Digital technology has changed the business models of companies, leading to an increase in productivity [29].

3 Hypotheses Development

Digital transformation the process of change towards information technology and communications technology, and the banking sector includes the digitization of documents, electronic signature, and digital currency trading. In the twenty-first century, the world witnessed a revolution in smartphone technology and applications, which facilitated the transformation in how we interact with the digital environment. Concepts such as artificial intelligence and machine learning technologies also emerged, adding a new dimension to digital technology and its use in various fields [5].

H.1: There is a relationship between the degree to which banks embrace digital transformation and improved customer satisfaction.

Trust has been defined in several forms, including that the consumer is willing to use something in exchange for the other party being able to meet the consumer's needs, and that trust results from a deep desire to do something [30].

Banking applications via mobile phones have been classified as one of the most important services, especially in developing countries, trust is considered one of the

most important variables regarding a sensitive topic such as money, and this trust affects the level of customer satisfaction with banking services, trust has been defined as credibility and ethics, it is a feeling that works against the feeling of uncertainty [31, 32].

Banks seek to empower customers digitally by exploiting the mobile phones that customers own without regard to geographic restrictions and to dispense with cash in hand, through mobile phone applications. Given that banks aim to reach customer satisfaction, the customer must feel safe when using the digital applications, and that there is integrity in the digital banking application [33]. Therefore, banks work to use modern and advanced systems to maintain the security of customers' personal and sensitive information within a group of security issues, and any defect in this security causes great harm to the bank and its customers [34].

H.2: The level of digital security available in banking services affects the level of customer satisfaction.

"Internet banking (e-banking) is the use of internet and telecommunication networks to deliver a wide range of value added products and services to bank customers", Internet banking services are often considered a complement to real banking services, which has enabled customers to conduct their electronic banking transactions at times convenient for them without the need to go to the bank. A modern type of banks has emerged without real headquarters, only virtually via the Internet, which helps banks to enter the financial markets, without the actual need for a physical bank headquarters. Mobile banking is among the latest in a series of recent mobile technological wonders. Although automated teller machine (ATM), telephone, and Internet banking offer effective delivery channels for traditional banking products.

H.3 There is a relationship between the usefulness mobile applications and customer satisfaction.

In the master's thesis conducted on banks in UK, the results were summarized that banks can provide several digital banking services, which improves the customer experience by ensuring that they have access to the various services comfortably, in addition to sending text messages to customers in the form of alerts in a regular manner. Continuously to inform them of the status of their bank accounts, and to ensure the best experience for them, so that banks consider that both employees and customers must participate through an appropriate investment strategy, and continue digital innovation [35].

It must be noted that the provision of a number of ATMs contributes to greater access to customers, which helps reduce the costs of financial transactions, in addition to bank branches and specialized centers for communications, electronic services, and Internet services. All of the above contributes to giving customers a feeling of security, safety, ease of use, and reducing restrictions, which constitutes a factor. Fundamental to customer satisfaction [36]. Raising the level of banking service and reaching the largest number of customers has a significant impact on the development of banking industries, which enhances customer satisfaction when they access information, web services, advanced and modern programs and devices [37].

H.4 There is a relationship between the accessibility and customer satisfaction.

There is a strong relationship between the accessibility of services and resources and customer satisfaction. If customers can reach the products they need faster that's will increase the loyalty and their experience is good and of high value, if the distance is long, this increases the cost of time and effort, and vice versa, because cost is an important criterion, and the high cost of transportation, shipping also does not facilitate easy access to the product, and contributes to low customer loyalty and lack of satisfaction.

With the digital change in banks, consumers have increased their feeling that they are able to perform electronic banking tasks and thus increase the customer base. Given the possibility of customers accessing the Internet on their mobile phones at all times and places, they can now access their bank accounts, which prompts banks to adopt new strategies that seek to Address customers electronically and build a good relationship with them to obtain their satisfaction

Customer satisfaction is considered one of the important factors that help banks maintain their competitive advantage, so banks seek to provide the best electronic banking services with a focus on important elements such as cloud computing, digital security, and the quality of digital services provided, and all of this is available with the availability of appropriate infrastructure, and is achieved. Spending a lot of money to ensure that services continue to be provided in the best way to customers, while maintaining banking privacy and security by preventing hackers from penetrating customer information. Some banks apply the digital electronic signature, which is considered of great importance to enhance security and is based on encryption of electronic information [38].

H.5: There is relationship between user experience and customer satisfaction.

Adoption of use digital banking according to Technology Acceptance Model (TAM) Mobile banking application preferences, social factors, perceived risk and trust is affecting customer behavior whilst the easy of using, ease-of-use and utility are not significant [39], another study has been referred to as intrinsic, frictional, and transitional frames, depicting the cognitive progression of end-users when interacting with digital artefacts as well as negotiating the institutional complexity [40].

H.6 There is a relationship between the digital interaction and customer satisfaction.

4 Methodology

This study adopted the descriptive methodology, where data is collected through the distribution of an electronic questionnaire, the questionnaire questions were designed based on previous research, consisting of 21 items. The questionnaire is divided into two parts: The first section focuses on demographic information such as gender and qualifications, while the second section consists of 21 items. Responses to each item were scored on a five-point Likert scale [41], The questionnaire elements were translated from English to Arabic, their answers were based on a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree), and SPSS was used

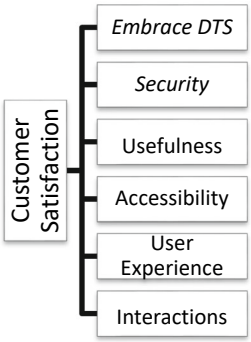


Fig. 1 Study model dependent versus independent variables

Table 1 Sample distribution according to independent study variable

Variable	Class	Frequency	Percentage %
Gender	Male	39	30.5
	Female	89	69.5
Qualification	Secondary	3	2.3
	Diploma	7	5.5
	B.A	49	38.3
	M.A and more	69	53.9
Total		128	100

to analyze the data statistically [42]. The population of the study bank customers in Palestine who use banking applications. The study sample have been chosen randomly in order to administrate the study tool as the reliability coefficient was calculated using the Cronbach alpha equation and its result was (89.1) which is acceptable.

The population in this research is 156 respondents, in Palestine, and the questionnaire was distributed using the random sampling method, but 28 questionnaires were excluded due to the respondents not using mobile banking services, so the final number of the sample is 128 respondents, customers in year 2023/2023. The background of male and female. Moreover, the respondents were varied in terms of qualification and the use of mobile in bank services as shown in Table 1.

5 Data Analysis

Descriptive statistical analysis was achieved through the researcher's use of descriptive tests. To analyze the results reached, the researcher relied on using the following scale to represent the estimated level of responses marked as high from 3.5 and more, moderate from 2.5 to 3.49 and low as less than 2.49°. Results of the questionnaire

Table 2 Shows that the total score for the impact of mobile banking services in improving the customer satisfaction

No.	Domain	Means	Standard deviations	Estimation level
1	Banks embrace digital transformation	3.67	0.62	High
2	Security	3.50	0.52	High
3	The useful of mobile apps	3.82	0.56	High
4	The accessibility	3.88	0.75	High
5	User experience	3.47	0.61	Moderate
6	Digital interaction	3.97	0.67	High
Total		3.72	0.47	High

related to the variables measured based on arithmetic means and standard deviations and estimated level according to customers' point of view in descending order as shown in Table 2.

The overall result from the customers' point of view reached (3.72). This shows that the level of appreciation is high, and the highest average was for the "Digital Interaction" field, where it received (3.97). The lowest average was for the "User Experience" field, which obtained (3.47).

5.1 Result Discussion

The total degree of the relationship between the degree to which banks embrace digital transformation and improved customer experience was (3.67) which suggests a high level of estimation. The highest mean was given to the item "The concept of mobile banking is concerned with the current and future interests of its users." which scored (3.83). On the other hand, the lowest mean was given to the item "The app has features tailored to me" which scored (3.32). The results mean that there is a relationship between the degree to which banks embrace digital transformation and improved customer experience.

The total degree of *digital security available in banking services affects the level of customer satisfaction* was (3.50) which suggests a high level of estimation. The highest mean was given to the item "All transaction confirmation details related to mobile banking (SMS or email) are sent within 24 h." which scored (3.83).On the other hand, The lowest mean was given to the item "Do you have any concerns about the security of online banking" which scored (3.27). The results mean that the level of digital security available in banking services affects the level of customer satisfaction.

The total degree of relationship between the mobile applications and customer satisfaction was (3.82) which suggests a high level of estimation. The highest mean was given to the item "Do you find that using mobile banking contributes to improving

your banking experience." which scored (4.16). On the other hand, the lowest mean was given to the item "Information and instructions related to mobile banking are easy to understand" which scored (3.60). The results mean that there is a relationship between the mobile applications and customer satisfaction….

The total degree of the relationship between the accessibility and customer satisfaction n. was (3.88) which suggests a high level of estimation. The highest mean was given to the item "Mobile APP can be accessed 24 h * 7 anywhere, anytime." which scored (4.03).On the other hand, The lowest mean was given to the item "I am aware of mobile banking by visiting its website and getting information about it" which scored (3.73). The results mean that there is a relationship between the accessibility and customer satisfaction.

The total degree of the relationship between the relationship between the experience and customer satisfaction it was (3.47) which suggests a moderate level of estimation. The highest mean was given to the item "The bank representative deals with customer complaints regarding the electronic service with respect." which scored (3.80). On the other hand, the lowest mean was given to the item "When you have a problem, the bank shows sincere interest in resolving it through chat on the app." which scored (3.28). The results mean that there is relationship between user experience and customer satisfaction.

The total degree of the relationship between the relationship between digital interaction and customer satisfaction it was (3.97) which suggests a high level of estimation. The highest mean was given to the items "Mobile banking enhances my effectiveness in utilizing the banking service and I feel satisfied when conducting online transactions in the online banking facility." which scored (3.97).The results mean that There is relationship between digital interaction and customer satisfaction.

6 Conclusion

In conclusion, this research highlights the significant positive impact of mobile banking services on improving the overall banking experience from the customers' perspective. The findings underscore the effectiveness and quality of mobile banking services in enhancing customer satisfaction, with a notable 73.8% of respondents acknowledging a high level of appreciation for these services. Despite concerns about the security of online banking, the study reveals that customers perceive mobile banking as a valuable tool for accessing banking services conveniently.

7 Recommendations

According to the study results, the following recommendations have been suggested, Banks must continue to enhance the provision of online banking services to ensure customer satisfaction, the design of the bank's application should be appropriate and

easy to use educate customers that using services Online banking is safe and they can train customers on that and more researches about the effect of mobile banking on improving banking experience should be conducted.

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Examining the Relationship Between Hiring People with Disabilities and Customer Perspectives: Moderator Role of Physical Disability



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Abstract This study aims to investigate the impact of hiring people with disabilities in Jordan's service sector on customer perspectives. The study utilized quantitative research methods to get the necessary data. The research sample was chosen through convenience sampling and consisted of 765 social media users from various age demographics. Several social media channels were utilized to distribute an online questionnaire for data collection. The results suggest that the preceding variable has a positive impact on the subsequent variables (brand image and loyalty), however, it does not have an impact on the desire to make a purchase or the act of categorizing someone based on stereotypes. Also, recruiting disabled individuals has the biggest effect on brand impression. The study's findings might potentially assist current and future entrepreneurs in building socially responsible, sustainable firms. In addition, scientists, governments, and politicians worldwide have focused on entrepreneurship. Entrepreneurship created new ideas, some of which are vital to corporate survival. Thus, social entrepreneurship evolved, and socially mature consumers demanded socially responsible businesses that benefit society.

Keywords Persons with disability · Hospitality · Service staff · Brand image · Customers' loyalty

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1 Introduction

People with disabilities confront several obstacles that prohibit them from leading a normal life and actively engaging in the greater community in today's society. Each of humans' rights is universal, interrelated, interdependent, and reliant on each other. In 2021, the World Health Organization (WHO) reported that approximately 15% of the global population suffers from a handicap. Additionally, the Bureau of Statistics (BLS) reported that the unemployment rate for individuals with disabilities was 80.9% in 2021, while it was only 36.3% for those without a disability. The citation is from the Bureau of Statistics (BLS) in 2022. Consequently, the combination of low employment rates and poor pay leads to individuals with disabilities (PWDs) experiencing the individuals with disabilities have much higher poverty rates than those without disabilities. This is a result of their marginalized status as a discriminatory minority [29].

Along with a rise in public understanding of the rights of people with disabilities comes a surge in demand from socially conscious consumers for businesses to hire members of this marginalized group and to provide accessible facilities in the workplace [31]. Yet, and despite the efforts of business owners to include individuals with disabilities in their workforces, the inclusion of disabled persons in the workforce continues to be a societal challenge, especially for frontline staff [1, 55]. Employers' stigmas and biases against such groups of society are the primary causes of PWD underemployment. In addition, persons with disabilities face a number of obstacles that prevent them from reaching full social and economic participation. These obstacles include inaccessible physical surroundings, a dearth of assistive technologies, discriminatory attitudes, and stigmas [65]. Given the absence of strict restrictions or obligations to support the rights of disadvantaged individuals, this research is crucial for a society that aims to become more socially conscious and empower socially responsible consumers, businesses, and decision-makers [41]. Therefore, enabling the involvement of persons with disabilities (PWD) in the workforce will result in a reduction in poverty, and conversely, poverty reduction will contribute to increased engagement of PWD in the labor market [29]. This is due to the fact that individuals with disabilities will impose a reduced financial strain on their family and they will actively participate in society, making valuable contributions. Given the significance of incorporating persons with disabilities (PWDs) into the workforce and their influence on customers' perceptions, In order to fill the literature gap, Kalargyrou et al. [39] conceptual model was adjusted to meet this research's goals. The study hypothesis, theoretical framework, and research design will follow the model's discussion and literature review. Therefore, the authors came up with the following research questions:

1. What is the impact of being assisted by an employee with a disability on consumers' perceptions?
2. What is the influence of physical disability on the relationship between employers and customers?

3. Will the recruitment of individuals with disabilities as front-line personnel pose a challenge for firms in the hospitality sector in Jordan?

2 Literature Review

2.1 Customers' Perceptions on Hiring Disabled People

As stated by the Engel, Kollat, and Blackwell decision-making model, some aspects of a customer's outlook either before or after obtaining a service have been linked to subsequent actions [61]. To be more precise, the procedure for making decisions is difficult because it is based on intrinsic customer experience factors that are subsequently incorporated into a conclusive determination [10].

Although claims by proponents that every individual possesses the ability of working and the many advantages that employing individuals with disabilities can give to organizations, some businesses are wary of the prejudiced reactions they may get from customers [30]. Despite companies' good attitudes regarding disability, many continue to discriminate in their employment practices [20], Prior study has shown that both managers and employees generally hold negative opinions towards hiring individuals with disabilities (PWD) [37]. Furthermore, according to the literature, disability type had a significant effect in the employment of PWDs [19], Furthermore, it has been observed that individuals' opinions are shaped by the specific sort of handicap they have [54]. However, companies that have implemented disability inclusion in the workplace recognize that employing individuals with disabilities has had a beneficial effect on their organizations as a whole.

Consequently, the previous was countered by study that revealed consistently beneficial Impact of integrating disability inclusion on customers' attitudes. Previous study demonstrates that CSR has a positive effect on customers' behaviors [42],Several studies have demonstrated that a company's attitude toward its consumers improves when they hire persons with disabilities [22], Although the prices are rising, especially when human beings, as opposed to animals or the environment, are the intended recipients of the socially responsible actions. In addition, according to a survey conducted in the United States, According to a recent survey, 92% of consumers have a positive impression of businesses who hire individuals with disabilities because they are more likely to care about their workers [31]. This was proved by the fact that individuals were willing to support such groups [39].

2.2 Loyalty

According to some experts, loyalty is developed when a firm generates a sense of appreciation in the consumer's eyes, hence fostering long-term customer loyalty [12]. According to Thiruvattal [66] the production of value is an additional method

of gaining customer loyalty, when benefits are gained that go beyond the product's inherent qualities. Also, Petrick [59] had mentioned that five aspects of value creation suggest, organizational reputation is one method of producing value. Moreover, trust is essential in establishing the link between CSR and loyalty [4], and it has been shown to mediate the relationship between them [11]. According to Oliver [56], fostering loyalty between a company and its customers begins with the company providing information that helps customers understand the brand.

Although loyalty has received significant attention in marketing literature, it has been less explored in the context of consumers' attitudes toward employing PWDs. When examining the impact of CSR on loyalty, the literature presents mixed findings, with most studies indicating that CSR positively influences consumer loyalty [6, 51], confirming the favorable correlation between the two variables found in previous studies [12], CSR has been shown to boost customer loyalty, which has a favorable influence on customer retention, according to these studies [3] Moreover, González and Fernández [31] claimed that employing persons with disabilities would increase brand loyalty.

Others have proposed that a positive association exists due to the mediating influence of trust between businesses and their clients [4]. Although some research showed that CSR has no influence on the loyalty of brand [8], others determined that the association between CSR and loyalty is minimal. Based on the preceding material, we propose:

H1a Hiring individuals with disabilities has a statistically significant effect on consumer loyalty, with a significance level of ≤ 0.05.

2.3 Stereotyping

Stereotyping is the act of qualifying a particular behavior toward a group or identifying certain features with a certain group [62]. Persons with disabilities may suffer prejudgments attitudes comparable to religion, gender, age, nationality, and ethnic stereotyping. Many feel that disability is a calamity and that they be worthy sympathy. Those with normal physical abilities are socially expected to care for those who cannot care for themselves, and those who care for the disabled are seen as deserving recipients of pity and sympathy [50].

It is often assumed that disabled individuals will always have a low quality of life, contributing to the belief that they will be unable to raise a family, find suitable employment, or perform other duties. Conversely, some view people with disabilities as strong, brave, inspiring, and heroic, which places significant pressure on them to constantly make the most of their situation [50]. Additionally, some individuals fear people with disabilities, believing they are a sign of bad luck. People with disabilities, especially those with mental disorders, often face hostility and violence because they are perceived as dangerous. The aforementioned preconceptions have been etched in the minds of society by the continued exclusion of individuals with disabilities from significant communal activities [50].

Previous studies indicate that companies prioritize appearance over trainable skills in frontline workers [33]. Moreover, there's a hypothesis suggesting that physically attractive individuals have better employment prospects and higher incomes [28], (p. 233). Consequently, when a customer interacts with an employee with a visible disability, their perceptions of people with disabilities may be influenced by potential negative attitudes or emotional reactions. This could be attributed to the halo effect, where one characteristic influences perceptions of others [53]. Meanwhile, According to a study of hospitality employers, companies share similar concerns regarding the inability of people with disabilities to perform essential tasks or the need for additional nonspecific accommodation expenditures as defined by the Americans with Disabilities Act (ADA), even If such lodgings are not prohibitively costly. As a result, the following theory was devised:

H1b Hiring individuals with disabilities has a statistically significant effect on stereotyping in customers' behaviours, with a significance level of ≤ 0.05.

2.4 Brand Image

Being recognized for one's activities is an ongoing issue for businesses; hence, it is vital to communicate their image to the public, which is seen as a crucial factor in establishing a prosperous environment and a strategic marketing plan [68]. Corporate brand image, a crucial component in acquiring brand equity, is defined as the positive and negative qualities and attributes that society associates with a particular company [49]. Additionally, when people have a favorable perception of a brand, its communication has a stronger impact compared to its competitors [35], as it is considered a significant predictor of customers' purchasing behavior [21]. A brand with a positive public image enjoys a better market position, sustained advantage, and increased market share [64]. Customer satisfaction is also positively correlated with brand image [14]. Although few studies have examined the impact of employing individuals with disabilities on brand image, it is well established that CSR is crucial in developing a favorable brand image [32]. CSR can also be used as a differentiation strategy. Previous studies have supported this, indicating that CSR positively impacts brand image [68]. Moreover, it has been shown that brand image has a beneficial association with corporate philanthropy actions [60]. Philanthropic actions have also been shown to have a positive impact on brand image from both employee and employer perspectives [37], Although having a person with a disability serve you has been shown to improve a company's image [30]. Thus, the following hypothesis was formulated:

H1c Hiring individuals with disabilities has a statistically significant effect on brand image, with a significance level of ≤ 0.05.

2.5 Purchase Intention

According to Lakhan [43] buying intent has been defined as a customer's behavioral attitude and desire to buy a service or a product. Numerous studies have been done to see what effect CSR has on buying intentions. A substantial amount of material has been written on the impact of employing individuals with disabilities on customers' buying intentions. One sort of CSR is economic CSR, in which a corporation creates products or services that generate employment for people of society, allowing individuals to make a livelihood and the company to profit [52]. As per the findings of Lee and Lee [45], Firms are required to take part in economic CSR activities so that they can meet the buying demands of customers. This means that customers want to protect their resources, which means that customers have buying power.

Similarly, lawful CSR operations in which a company abides by local rules and regulations led to increased consumer inclination to make purchases [45]. Another sort of CSR is ethical CSR, in which a company respects the moral rights of its stakeholders [23]. Companies who ignored ethical concerns in the past saw their market share decline. As a result, ethical CSR actions by businesses are likely to favorably affect consumers' purchasing intentions [52]. Lastly, charitable CSR initiatives that increase the well-being and goodwill of others are predicted to strengthen consumers' purchasing intentions.

This is also consistent with the results of Alniacik et al. [9], demonstrating that corporate charitable efforts have a beneficial effect on consumers' purchase intentions, particularly when these actions are connected to customers' value views. So, the discussion above leads to the following hypothesis:

H1d The hiring of individuals with disabilities has a statistically significant effect on customers' intention to make a purchase, with a significance level of $\leq$ 0.05.

2.6 Physical Disability

The effect of the kind of impairment has a significant part in how consumers see disability and how certain attitudes are therefore impacted. As a general rule, corporations find it more challenging to recruit persons with intellectual handicap and prefer to include those with physical disabilities [16]. People tend to concentrate more on the obstacles of employing a disabled person than on the potential advantages [16]. Each form of handicap necessitates individualized modifications to the work environment. Even though these reforms were linked with modest costs, companies continue to discriminate against disabled employees [7]. In 2007, thirty percent of Walgreens workers were disabled. This resulted in a 20% efficiency boost compared to facilities without disability accommodations (ibid). In addition, it was observed that the turnover rate for those with disabilities was half that of those without disability.

There are several forms of impairments, some of which are apparent and others of which are not. According to a list compiled by Aruma, this research will examine

the moderating influence of some of the most prevalent major categories of disability worldwide [15]. Considering the most common disability in Jordan. This research will mostly focus on physical disability. Physical disability refers to a condition that hinders a person's ability to move, perform motor tasks, or engage in physical activities [15]. Physical impairment was the second most prevalent form of disability in Jordan, affecting a total of 275,833 Jordanians. Hearing disability, the third most prevalent condition in Jordan with 182,318 Jordanians affected according to the, refers to a sensory impairment that results in a partial or complete inability to hear [15]. Individuals with physical disabilities are often subjected to greater rates of stereotyping because their presence makes others uncomfortable [39] Additionally, it is believed that individuals with lower physical attractiveness experience less social and personal acceptance. Hence, the following hypothesis is proposed:

H2a A physical disadvantage would have a moderating effect on the influence of hiring individuals with disabilities on consumers' loyalty, with a significance threshold of ≤ 0.05.

H2b Physical disability will moderate the impact of hiring people with disabilities on customers' stereotyping at a significance level of ≤ 0.05.

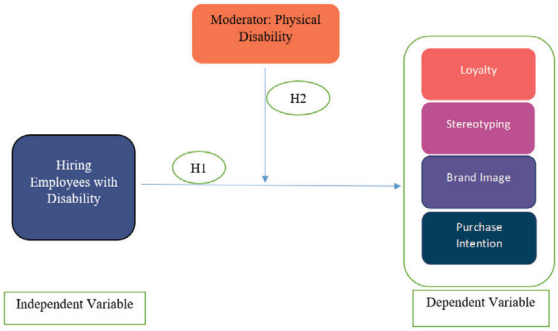
H2c Physical disability will moderate the impact of hiring people with disabilities on customers' brand image at a significance level of ≤ 0.05.

H2d Physical disability will moderate the impact of hiring people with disabilities on customers' purchase intentions at a significance level of ≤ 0.05.

3 Methodology

To evaluate this proposed model, a quantitative research approach was employed, utilizing convenient sampling and standardized instruments for data collection. Data was gathered through an online survey conducted via a questionnaire created using Google Forms. A 5-point Likert scale was used to assess all survey items, excluding demographic characteristics, with response options ranging from "1 = strongly disagree" to "5 = strongly agree." A practical sampling method was implemented. In Jordan, 275,833 individuals experienced physical hardships, with 184,443 facing minor difficulties, 73,584 severe difficulties, and 17,806 completely paralyzed. It was also noted that individuals with physical disabilities comprised the highest percentage of those with disabilities in the public sector workforce. The study's sample size included 820 respondents, but due to 55 uninterested responses, the final participant count was 765. Participants were Jordanians aged over 18. Demographic details included 409 single and 356 married participants. Age distribution was as follows: 18–20 years (100, 13.1%), 20–35 years (402, 52.5%), 36–50 years (155, 20.3%), 51–65 years (83, 10.8%), and over 65 years (25, 3.3%). Regarding education, 19.7% had a high school degree, 55.7% held a bachelor's degree, 13.7% had a master's degree, and 10.8% had a Ph.D. degree. In the data analysis technique for assessing observations, Excel 2016 and SPSS version were used. In this study, the Structural Equation Modeling (SEM) method was used. Cronbach Alpha was utilized to verify

Fig. 1 Research model



the measurement model as a confirmatory factor. The Cronbach Alpha value for the dependability of all constructions was 0.82.

3.1 Research Model

Figure 1 was nominated as the research model based on the preceding study and the observed gaps in the literature, as well as the hypotheses mentioned in the preceding section.

4 Data Analysis

4.1 Construct Reliability

The reliability of the constructs was examined using Cronbach's alpha coefficient and SPSS, and its results above the minimum required value of the cut point (0.7) [47], as shown in Table 1, which was documented to be statistically significant (0.82). The Cronbach Alpha coefficient was employed as a confirmatory factor to establish the validity of the measurement model. Reliability of all constructs was assessed, and the Cronbach Alpha coefficient yielded a score of 0.95. Furthermore, in order to evaluate the accuracy and coherence of the questionnaire items, the questionnaire was subjected to a pre-test conducted by four experts, including two professors from PSUT and two from another institution in Jordan. After reviewing their feedback, many questions were modified to simplify their language and content, which were initially complicated. The omission of one moderator (Speech and Language handicap) was done to simplify the questionnaire and the model.

Table 1 Construct reliability

Construct name	Cronbach alpha
Hiring people with disability	0.70
Dependent variables	0.92
Loyalty	0.85
Stereotyping	0.77
Brand image	0.88
Purchase intention	0.80
Types of disabilities	
Physical disability	0.84
All items Cronbach alpha	0.82

Table 2 Standardized estimates

			Std. Estimate	P
L	< –	H	0.169	***
S	< –	H	0.037	0.319
P	< –	H	0.052	0.238
B	< –	H	0.338	***

4.2 Model Testing

To test the hypothesis, AMOS was used to run the model. To determine the importance of each impact, it was important to take into consideration both the standardized estimate values and the *P* values. For H1a, estimates were ($\beta = 0.169$, p 0.05), showing that a substantial positive link is frequently believed to exist between employing persons with disabilities and consumer loyalty. Hence, H1a was accepted. In addition, the findings for Hypothesis H1b indicated that there was no significant relationship between employing persons with disabilities and stereotyping ($\beta = 0.037$, $p = 0.319$), hence Hypothesis H1b was rejected. Regarding the association between employing persons with disabilities and purchasing intention, H1d is rejected due to the lack of a significant impact ($\beta = 0.052$, $p = 0.238$). In conclusion, H1c is to be acknowledged since there was a substantial favorable relationship between employing persons with disabilities and brand image ($\beta = 0.338$, p 0.05). Thus, brand image has the highest correlation with employing persons with disabilities up to date.

In addition, as shown in Table 3, the impact of the interaction between each moderator was assessed for each distinct link between the dependent and independent variables, and the following findings were obtained:

There was a good correlation between employing individuals with physical disabilities and brand image, as well as buy intent; thus, H2c and H2d are approved. Additionally, although employing individuals with disabilities did not have a substantial influence on stereotyping in general, stereotyped behavior was seen against

Table 3 Moderator effect

Physical disability		
	Std. Beta	Sig
Loyalty	0.058	0.253
Stereotyping	0.083	0.035
Brand image	0.179	0.000
Purchase intention	0.254	0.000

persons with physical disabilities despite the belief that they were competent enough to execute their occupations; hence, H2b is rejected. Yet, there was no statistically significant effect of employing persons with physical disabilities on loyalty; consequently, H2a is rejected.

AMOS was utilized to run a multi-group test aimed at determining the impact of gender on the relationship between hiring individuals with disabilities and customer opinions. Regarding receiving a service from a handicapped individual, the research showed that there was no notable distinction between males and females, except for the connection between quality and female gender, which was statistically significant. Furthermore, a multi-group study was performed to examine a previous scenario in which participants were attended to by an individual with a disability. The results indicated that there was no statistically significant distinction between the experience of receiving a service from a person with a disability and the perceptions of consumers who were imagining a hypothetical scenario in which they would be served by an individual with a handicap. Finally, a multi-group analysis was performed to ascertain the variations in outcomes depending on the presence of a close friend or a family member with a handicap.

5 Discussion and Conclusion

The provided study studied the impact of employing persons with disabilities on the loyalty, buy intent, stereotyping, and brand image of several consumer segments. As a basis for the support of the employment of PWD, the model offered contributes to current and future entrepreneurial social intents. When a person with a disability served them, two dependent variables (loyalty and brand image) were positively influenced by a direct effect. Hence, the following hypotheses were confirmed:

H1a Hiring individuals with disabilities has a statistically significant effect on consumer loyalty, with a significance level of ≤ 0.05.

H1c Hiring individuals with disabilities has a statistically significant effect on brand image, with a significance level of ≤ 0.05.

Nevertheless, the standardized coefficient (β) was not the same for all three associations. The highest value was found for brand image ($\beta = 0.338$), and the lowest value was found for loyalty ($\beta = 0.169$) maximizing the effectiveness of the link

between the experience of obtaining a service from a member of staff who has a disability and the image of the brand.

These findings provide credence to previous studies that found a favorable influence on brand image resulted from the employment of individuals with disabilities [2, 26, 30, 34, 37, 54, 57], as well as other more studies that discovered a direct and positive correlation between brand recognition and CSR. [5, 13, 17, 32, 44], or the study by Poudyal and Yukongdi [60] This suggested a positive association between the image of the brand and the corporate philanthropy efforts of the company.

In addition, our findings align with previous research demonstrating that loyalty has a favorable relationship with business CSR actions in general [6, 12, 31, 51] claimed that increasing the proportion of employees with disabilities enhances consumer trust in the brand. Conversely, our findings contradict those of [8], who suggested no relationship between these variables, and [48], who found no relationship between CSR and loyalty.

Our findings about the link between stereotyping and employing disabled individuals ran counter to other studies that revealed unfavorable sentiments toward disabled people as they were seen as less capable, unreliable, and more likely to be stigmatized [46, 67], while this research finding were in line with Kalargyrou et al. [40] implying that there is no connection between the two. In this sense, the following theory is rejected:

H1b Hiring individuals with disabilities has a statistically significant effect on stereotyping in customers' behaviours, with a significance level of ≤ 0.05.

In contrast to prior research indicating a positive correlation between hiring people with disabilities and customers' purchase intentions, our study did not find such an effect [22, 38]. Likewise, other studies have suggested a moderate positive relationship between corporate social responsibility (CSR) and purchase intentions [18, 24, 25, 63]. Our results contradict the findings of Alniacik et al. [9], providing more evidence that corporate charitable acts have a beneficial impact on consumers' purchase intentions, especially when these actions align with customers' values. Therefore, the aforementioned hypothesis is rejected:

H1d The hiring of individuals with disabilities has a statistically significant effect on customers' intention to make a purchase, with a significance level of ≤ 0.05.

Finally, the multigraph analysis showed that there were no differences in the results obtained from male and female participants, with the exception of quality. While receiving service from an individual with a disability, women exhibited greater rates of perceived quality, which confirms the findings of earlier suggestions made by male participants [39]. This may be justified due to the common assumption that women are more emotionally bonding than males. This is because the idea of self-perception states that compassion is regarded a sense of self-other resemblance [27, 36, 58]. In the past, the fact that a handicapped person provided a service for you did not influence any of the factors in any way. In addition, the only individuals whose

perceptions of quality were altered were those who reported having a disabled close friend or family member.

5.1 Theoretical Implications

The model developed for this study holds significant importance as it expands current understanding of social entrepreneurship by incorporating four key variables—loyalty, stereotyping, purchase intention, and brand image—within the context of the hospitality sector in the Jordanian market. By comprehensively examining these variables, our study sheds light on crucial aspects of business dynamics in this specific industry. Moreover, our research addresses notable gaps in knowledge concerning the employment of individuals with disabilities within the hospitality sector. There is a scarcity of research studies focusing on this topic globally, and to the best of our knowledge, no study has explored this subject in the Jordanian context. Therefore, our study represents a pioneering effort in this area, paving the way for further exploration and understanding. The findings of our study will serve as a foundational platform for future research endeavors in Jordan, providing valuable insights into the dynamics of hiring individuals with disabilities in the hospitality sector. Furthermore, our research contributes to the broader global discourse on social entrepreneurship and inclusivity, offering insights that can inform policy-making and business practices worldwide. By filling these knowledge gaps and generating empirical evidence, our study aims to foster greater awareness and understanding of the benefits of employing individuals with disabilities, ultimately promoting inclusivity and social responsibility within the hospitality industry.

5.2 Practical Implications

Given the acknowledged significance of the hospitality industry to a nation's economic development, there has been notable attention from policymakers, researchers, and governments worldwide. The industry has continually evolved, introducing new concepts crucial for business survival. However, amidst this evolution, there's a growing demand from socially conscious consumers and advocates of social entrepreneurship. These individuals seek businesses committed to social responsibility and contributing to the well-being of society. In response to this societal shift, our research focuses on empowering current and future entrepreneurs to establish socially responsible businesses within the hospitality sector. By doing so, these businesses not only enhance their sustainability but also contribute positively to society. One crucial aspect of this endeavor is promoting fair work opportunities for individuals with disabilities and addressing the prevalent lack of understanding surrounding disabilities. Our study aims to broaden societal perspectives, particularly among entrepreneurs, to combat discrimination and foster inclusivity. By integrating

individuals with disabilities into future workforce planning, we can mitigate poverty rates among this demographic and empower them to become active contributors to society. Furthermore, our research will provide valuable insights into creating inclusive working environments, facilitating the integration of people with disabilities into the workforce.

Ultimately, our efforts seek to drive positive change within the hospitality industry, promoting social responsibility and inclusivity while redefining societal perceptions of disabilities. Through collaborative action and informed decision-making, we can create a more equitable and prosperous future for all individuals, including those with disabilities.

6 Conclusion

The goal of this study was to evaluate the influence of employing individuals with disabilities on customer perceptions in Jordan using a conceptual framework adopted from [39] research and then adjusted to match the objectives of this study. The established model examined the impact of employing individuals with disabilities on customer loyalty, stereotypes, brand image, and purchase intent. SPSS v.25 and AMOS v.26 were used to analyze the data, and the SEM method was applied to examine the relationship between the variables. Two variables (brand image and loyalty) were profoundly and favorably impacted by the experience of getting a service from a member of the service personnel who had a disability, indicating a strong relationship between hiring people with disabilities and these two variables. While the remaining variables were not significantly affected by the employment of individuals with disabilities. This study model is adopted for the first time in Jordan, hence, it may serve as a benchmark for future research. In addition, research indicate that employing individuals with impairments may not be as destructive to companies as some may fear. A lack of disability awareness may be responsible for adverse outcomes.

6.1 Limitations

Despite attempts, this study has limitations. The first was time. The researcher undertook two field trips to public sectors that should have relevant data on the stated issue, however it was discovered that such studies were not conducted until 2015 and were incomplete. This was a significant research constraint. Due to the researcher's restricted access to foreign and domestic sources on the subject, research was scant.

Another difficulty is the geographical restriction, since even with an online questionnaire, it was difficult to recruit volunteers from Jordan's other cities outside of Amman. Although their replies were crucial to the outcome of this study, the researcher also struggled to identify enough PWD to participate in the questionnaire

submission. The research was limited to the hotel business and excluded all sorts of handicap, preventing generalization.

Nevertheless, the notion that participants knew about the problem and the abilities of each handicap type precluded them from selecting which occupations disabled people could pursue. Future study will profile persons to exclude unqualified participants for more trustworthy outcomes.

Future research should incorporate field experiments to quantify real service encounters, offering better study settings. This will disclose the causes of crucial variables. A qualitative research technique employing PWD as a study sample would assist the literature understand the reason behind quantitate research's outcomes. To attain generality, future study may be imitation in other industries, distributing the sample across Jordan rather than focusing it on Amman. Finally, cultural studies on PWD reactions may assist professionals comprehend different cultures.

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The Effect of Brand on Consumer's Purchase Decision: Mobile Phones as a Case Study



Iyad A. A. Khanfar and Ahmed Khozaimyah

Abstract This chapter tries to investigate the influence of brand factors, including brand logo, reputation, loyalty, product quality, and perceived value, on the purchasing behavior of Jordanian consumers in the mobile phone market. A sample of 453 consumers in Amman was randomly selected, and a questionnaire was administered to collect data. The researchers employed an analytical descriptive approach and utilized SPSS software for data analysis. The findings of the study revealed a significant and statistically meaningful relationship between the brand and the purchase decision of Jordanian consumers for mobile phones in Amman. Furthermore, the results indicated that perceived value exerted the strongest impact on the purchase decision. Based on these findings, it is recommended that mobile phone companies provide consumers with ample information to facilitate informed purchasing decisions. Additionally, it is advised that consumers stay updated on the latest advertisements and promotional materials released by these companies in Jordan to enhance their knowledge and improve their purchasing choices.

Keywords Brand · Purchase decision · Jordanian consumer · Mobile phones · Amman

1 Introduction

Research has validated the significance of mobile phone brands within technologically advanced societies, wherein these brands permeate multiple dimensions of economic, social, and cultural existence. Given its impact on the perceptions of

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mobile phone consumers, the brand assumes a pivotal position within the realms of marketing and competition.

In the present day, the brand surpasses its mere designation or emblematic representation, instead serving as the essential component in the connection between the organization and its consumers, embodying their perspectives and comprehensions of the product and its efficacy. It offers strategic options for the brand to confront obstacles and rivalry. The expansion of the brand is regarded as an internal remedy for its advancement, although its implementation necessitates adherence to established criteria and sequential phases in order to attain triumph [2].

1.1 Problem Statement

With the advent of technological advancements and the availability of information, the telecommunications and mobile phone markets in Jordan have experienced a significant increase in competition among companies [4]. This has resulted in a wide range of well-established mobile phone brands flooding the Jordanian market, thereby complicating the decision-making process for consumers in Jordan. Therefore, the problem of the study lies in answering the following main question:

- Does the brand have an impact on the purchase decision of Jordanian consumers for mobile phones in Amman?

1.2 The Study Hypotheses

The main hypothesis:

- H0: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for the brand on the purchase decision of Jordanian consumers for mobile phones in Amman with its dimensions (brand reputation, brand quality, loyalty, brand logo, and perceived brand value)."

This leads to the following hypotheses:

- H01: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for the brand logo on the purchase decision of Jordanian consumers for mobile phones in Amman."
- H02: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for brand quality on the purchase decision of Jordanian consumers for mobile phones in Amman."
- H03: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for loyalty on the purchase decision of Jordanian consumers for mobile phones in Amman."

- H04: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for brand reputation on the purchase decision of Jordanian consumers for mobile phones in Amman."
- H05: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for perceived brand value on the purchase decision of Jordanian consumers for mobile phones in Amman."

2 Previous Studies

The importance of brands in consumer preferences has been backed up by various studies which point out to the need for this reason: [6] highlights that we must look at brand characteristics, that the positive influence can have on consumer preference needs be ascertained through the analysis of these traits. Similarly, Al-Amawi and Hussein's study [1] identifies internal branding as a key driver for bank performance and service quality, portraying it above mere cosmetic exercises but core determinants in delivery. Moreover, Attanahi's study [3] underlines brands' role not only in building trust with customers (who trust them already) but also acting as decision facilitators for consumers already willing to purchase. On top of this revelation, Nabli and Lamoushi's study [6] demonstrates positive relationships between attitudes taken by consumers and their decisions towards purchases which is an observation also made by [6], as well as Saraysh and Aish's work last year. These investigations bring into focus dimensions related to brand value whose direct impact not only on choice but even post-purchase satisfaction levels too.

3 Study Methodology

The primary aim of the research was to determine the effect of brand on consumers' purchasing behavior in Amman, Jordan especially in relation to mobile phones. The goal was achieved through use of a descriptive-analytical methodology to look into the hypothesis and its evaluation as presented in the study.

3.1 Study Population and Sample

The researchers decided to investigate users of mobile phone in the city of Amman to avoid challenges in getting an exact statistical sample. The sample size consisted of 500 individuals, which was chosen by following the methodology proposed for scientific research purposes. It is recommended a range between 300 and 500 individuals. Out of the 470 questionnaires received (a return rate of 94%), only 17 were

Table 1 Cronbach's Alpha coefficients and stability percentage (internal consistency of questionnaire items) variable of the study number of items Cronbach's Alpha

Variable of the study	Number of items	Cronbach's Alpha
Brand reputation	5	0.803
Brand quality	8	0.732
Brand loyalty	5	0.776
Brand logo	5	0.620
Perceived brand value	7	0.881
Jordanian consumer purchase decision	5	0.752
Overall instrument	35	0.911

incomplete and therefore not considered for analysis. As a result, 453 complete questionnaires (90% return rate) were used for the study, which is quite acceptable in the realm of scientific research.

3.2 Study Instrument Reliability

In order to assess the questionnaire's ability to accurately measure the intended factors and confirm its reliability, the researchers employed the internal consistency test, specifically by calculating Cronbach's alpha coefficient. This particular test was chosen due to its reliance on the consistency of individual responses across different questionnaire items, thereby indicating the strength of the correlation and coherence among these items. Moreover, the Cronbach's alpha coefficient offers an estimation of the questionnaire's reliability. This information is presented in Table 1.

The potential stability of the results obtained from the application of the questionnaire can be inferred from the data presented in Table 1. The stability degree, which reached 91.1%, surpasses the minimum acceptable threshold of 60% for Cronbach's alpha coefficient. This indicates that the values mentioned in the table are all greater than 60%, thereby supporting the generalizability of the results. It is worth noting that a percentage of 60% or higher is considered acceptable for humanities and social research [5, p. 268].

3.3 Statistical Methods Used in the Study

Upon gathering the data pertaining to the variables under investigation, a range of suitable statistical techniques were utilized through the SPSS statistical analysis software to analyze the data acquired during the field study. More specifically, the subsequent statistical methods were employed:

- **Cronbach's Alpha Coefficient**: The purpose of utilizing this approach was to assess the dependability of the research tool employed for data collection, specifically to evaluate the internal consistency of the questionnaire items.
- **Mean Calculation**: The purpose of this method was to ascertain the extent to which respondents in Amman evaluated the brand of mobile phones. This approach aided in gauging the respondents' ratings for each item of the study, enabling the distinction between high and low evaluations. Furthermore, it facilitated the organization of the items based on their highest mean scores.
- **Standard Deviation**: The aforementioned method was employed in order to ascertain the extent of variability among respondents' responses with respect to the average value.
- **Paired Sample t-test**: The goal of this chapter is to determine if there existed a statistically significant distinction between the brand and the purchasing choices of Jordanian consumers in relation to mobile phones.

4 The Results

4.1 Question One

- What is the level of assessment by the study sample individuals for the brand of mobile phones in Amman?

To answer the study's first question, the standard deviations and arithmetic means for the level of assessment by the study sample individuals for the brand of mobile phones in Amman were calculated as follows:

Brand Reputation

The findings presented in Table 2 highlight a notable upward trend in the average rating for the "Brand Reputation" aspect, which recorded a mean score of 4.23, accompanied by a standard deviation of 0.54. This mean score surpasses the predetermined benchmark of (3) out of (5) grades. Thus, these findings suggest that the participants in the study held positive evaluations regarding the "Brand Reputation" dimension of mobile phones in Amman, indicating a high level of satisfaction with the specific items comprising this dimension.

The findings are evident and captivating, revealing a strong reputation for the brands within the mentioned sector. The item that highlights the significance of established brands held a prominent position, whereas the item that prioritizes specifications was not as highly regarded by the buyers. These findings suggest that the reputation and recognition of a brand have a significant impact on consumer purchasing decisions, reflecting the trust and preference bestowed upon certain well-known brands.

Table 2 Standard deviations and arithmetic means calculated for brand reputation items (N = 453)

Item number	Items	Mean score	Standard deviation	Item rank	Assessment level
1	I gather information about mobile phone brands	4.16	0.69	4	High
2	I prefer choosing a mobile phone with a well-known brand	4.20	0.67	3	High
3	Mobile phone companies use brand names and sub-brands to serve different consumer segments, allowing the consumer to buy the most suitable one	4.28	0.73	2	High
4	When buying a mobile phone, I prefer brand reputation over its specifications	4.11	0.79	5	High
5	Mobile phones with well-known brand names are the most widespread	4.40	0.80	1	High
–	Brand reputation overall	4.23	0.54	–	High

Brand Quality

According to the data presented in Table 3, the average score for the "Brand Quality" dimension was found to be 4.09, with a standard deviation of 0.45. This value surpasses the specified threshold of (3) out of (5) grades. Consequently, it can be inferred that the respondents' evaluations of the items related to "Brand Quality" were predominantly positive, indicating a high level of satisfaction with mobile phones in Amman.

The findings of this study are both evident and captivating, as they reveal that a multitude of individuals believe that exposure to a wide range of brands aids them in making more informed choices. Moreover, it is apparent that the perceived high quality of a brand greatly influences consumers' purchasing decisions, as some individuals view high-quality branded smartphones as user-friendly. Consequently, these results suggest that the evaluation of brands in Amman was predominantly positive and held in high regard by the participants of this study.

Brand Loyalty

Table 4 data reveals a notably elevated average in the realm of brand loyalty, peaking at (4.12) with a deviation standard of (0.56). The benchmark set at (3) out of (5) points was exceeded by the mean value, an indication that respondents perceived their assessment positively with regards to items associated with brand loyalty for mobile phones in Amman. Their view on the evaluated dimension can thus be inferred as high from this context.

The findings reveal that the top-ranked item in this study was Item (15). This item obtained a mean score of 4.34 and a standard deviation of 0.70. Conversely,

Table 3 Standard deviations and arithmetic means calculated for items after brand quality (N = 453)

Item number	Items	Mean score	Standard deviation	Item rank	Assessment level
6	I consult experts about mobile phone brands before making a purchase decision	3.98	0.51	6	High
7	The wide variety of mobile phone brands in the Jordanian market enables me to make the best choice	4.32	0.65	1	High
8	The device I own has high specifications	3.97	1.02	7	High
9	The first thing I search for when buying a mobile phone is brand quality	4.18	0.78	2	High
10	Mobile phones with high-quality brands are easy to use	3.94	0.77	8	High
11	The brand of mobile phone provides diverse applications, encouraging me to purchase it	4.14	0.79	3	High
12	The presence of distinguished service centers for mobile phone brands affects my purchasing decision	4.13	0.68	4	High
13	The availability of spare parts for the mobile phone brand affects my purchasing decision	4.04	0.61	5	High
–	Brand quality	4.09	0.45	–	High

Table 4 Standard deviations and arithmetic means calculated for items after brand loyalty (N = 453)

Item number	Items	Mean score	Standard deviation	Item rank	Assessment level
14	Your mobile phone brand achieves the desired level of satisfaction	4.07	0.92	3	High
15	When asked by friends or relatives about a mobile phone, you recommend the brand you deal with	4.34	0.70	1	High
16	You prefer to change your mobile phone brand when it does not achieve the expected benefits	4.05	0.79	4	High
17	You prefer to replace your mobile phone by repeatedly purchasing the same brand you dealt with	3.99	0.84	5	High
18	You defend the mobile phone brand you deal with if someone speaks poorly of it	4.15	0.76	2	High
–	Brand loyalty	4.12	0.56	–	High

Item (17) ranked fifth and last with a mean score of 3.99 and a standard deviation of 0.84. An interesting point is that every average score related to these items has surpassed the evaluation standard set by the test of 3 out of 5 grades. It implies that those involved in the survey displayed favorable evaluations towards "Brand Loyalty" items, particularly with respect to mobile phones in Amman. As a result, we can deduce that the participants perceived the assessment level of this dimension as considerably high.

Brand Logo

The table reveals a noticeable rise in the average rating for the "Brand Logo" aspect depicted in Table 5. The mean score is 4.09, deviating by 0.47 points—notably exceeding the expected standard of three out of five grades. The result communicates that respondents have positively appraised the surveyed items on "Brand Logo" with regards to mobile phones in Amman. This suggests a keen evaluation specifically towards this element, implying distinctive satisfaction among the users surveyed for their perception regarding brand logos on their mobile phones within Amman's context.

Study results showed that Item (21) topped the list with an average score of (4.14) and a standard deviation of (0.74) while Item (19) landed in the fifth position, having an average score of (4.02) and a standard deviation of (0.52) as the last on the list. These numbers imply that all items' average scores in this dimension exceeded the benchmark value of three out of five, signaling positive evaluations from respondents on aspects related to 'Brand Logo' for mobile phones in Amman. The inference would

Table 5 Standard deviations and arithmetic means calculated for items after brand logo (N = 453)

Item number	Item	Arithmetic mean	Standard deviation	Item ranking	Assessment level
19	The brand logo expresses the characteristics and quality of the mobile phone	4.02	0.52	5	High
20	The brand logo of the mobile phone grabs my attention	4.08	0.88	3	High
21	Mobile phone companies choose the brand logo for their products in line with societal values	4.14	0.74	1	High
22	The brand logo matches the design of the mobile phone I purchased	4.04	0.78	4	High
23	The brand logo of the mobile phone reflects the social status of the consumer	4.13	0.71	2	High
–	After brand logo	4.08	0.47	–	High

then be that those who formed our sample perceived the assessment level for this dimension as high.

Perceived Brand Value

An increase in the mean score was seen with more clarity by all people. The category of "Perceived Brand Value" achieved an average collective score of 4.03, which has a standard deviation that amounted to 0.57. The result clearly indicates that the mean score has exceeded the expected benchmark of (3) out of (5) grades. Therefore, this implies that participants in the survey had a positive perception towards mobile phones in Amman. More specifically, it suggests that they viewed the brand value favorably, indicating their evaluation was significantly positive towards this aspect within the local market of Amman (Table 6).

Table 6 Arithmetic means and standard deviations calculated for items after perceived brand value (N = 453)

Item number	Item	Arithmetic mean	Standard deviation	Item ranking	Assessment level
24	The brand of the mobile phone I purchased achieves the expected benefits	4.15	0.69	1	High
25	Purchasing brands of mobile phones that match actual benefits generates a positive impression	3.92	0.83	7	High
26	The prices of mobile phones for different brands are commensurate with the benefits I receive	4.05	0.78	3	High
27	Mobile phones meet consumer needs, which encourages me to buy them	4.06	0.73	2	High
28	Mobile phones align with consumer desires, prompting me to purchase them	4.04	0.72	4	High
29	The availability of the brand of mobile phones at the right time influences my purchasing decision	4.02	0.72	5	High
30	The availability of the brand of mobile phones in the right place in the market influences my purchasing decision	3.96	0.78	6	High
–	After perceived brand value	4.03	0.57	–	High

Table 7 The calculated means and standard deviations for the dimensions of the mobile phone brand in the city of Amman (N = 315)

Dimension number	Brand dimensions of mobile phones in Amman (N = 315)	Arithmetic mean	Standard deviation	Relative importance
1	Brand reputation	4.23	0.54	1
2	Brand quality	4.09	0.45	3
3	Brand loyalty	4.12	0.56	2
4	Brand logo	4.08	0.47	4
5	Perceived brand value	4.03	0.57	5

The study findings point out that one of the items related to mobile phone brands, Item (24), scored the highest average at (4.15) with a standard deviation of (0.69). On the other hand, Item (25) was rated the lowest with an average score of (3.92) and a standard deviation of (0.83). These outcomes suggest that all item scores in this aspect were higher than the typical benchmark of (3) out of (5), meaning that respondents' evaluations towards these items post "Perceived Brand Value" were favorable and specific to mobile phones in Amman. Thus, it can be inferred that the assessment level of this dimension was perceived as high by the participants.

The relative importance of each dimension of the mobile phone brand was described. As shown in Table 7.

The findings presented in Table 7 provide a comprehensive overview of the perceived significance of different brand dimensions for mobile phones among the participants of the study. It is evident that Brand Reputation emerged as the most important dimension, occupying the top position in terms of priority. Following closely behind, Brand Loyalty secured the second position, while Brand Quality obtained the third rank. Brand Logo, on the other hand, occupied the fourth position, and Perceived Brand Value was ranked fifth and last in the hierarchy of importance as perceived by the study participants.

4.2 Question Two

- What is the level of evaluation by the study sample for the purchasing decision of Jordanian consumers for mobile phones in Amman?

To address the second research question, we computed the standard deviations and arithmetic means to assess the evaluations of the study participants concerning the level of evaluation of Jordanian consumers' purchasing decisions for mobile phones in Amman. The results stated in Table 8 reveal that the overall arithmetic mean for the variable "Jordanian consumer purchasing decision" was 4.20, with a standard deviation of 0.50. This value surpasses the test criterion of 3 out of 5 grades, indicating that the evaluations provided by the study participants regarding

the level of evaluation of the variable "Jordanian consumer purchasing decision" were positive. Thus, it can be inferred that the participants perceived the level of evaluation of this variable to be high.

The findings demonstrate that the item pertaining to the influence of brand quality on the decision to purchase a mobile phone (item 32) achieved the highest ranking, with an average score of 4.49 and a standard deviation of 0.59. On the other hand, the item regarding receiving more benefits from the mobile phone than expected (item 35) ranked fifth and last, with an average score of 4.04 and a standard deviation of 0.82. These results indicate that all the average scores for the items under this variable exceeded the threshold of 3 out of 5, suggesting that the participants in the study held positive evaluations regarding the level of assessment of the "Jordanian consumer purchasing decision" variable. Consequently, it can be inferred that the participants perceived this variable to be highly evaluated.

Table 8 The calculated standard deviations and means for the items of the variable "purchase decision" of Jordanian consumers for mobile phones in the city of Amman (N = 453)

Item number	Item	Arithmetic mean	Standard deviation	Item ranking	Assessment level
31	Brand Reputation influences the purchase decision for mobile phones	4.18	0.79	2	High
32	You find that the quality of the brand has a significant impact on your decision to purchase a mobile phone	4.49	0.59	1	High
33	You prefer to repeatedly purchase the same brand when replacing your mobile phone	4.10	0.79	4	High
34	The selection of brand logos by mobile phone companies helps me distinguish them from other brands, encouraging me to make a purchase decision	4.16	0.82	3	High
35	You get more benefits from the mobile phone than you expected	4.04	0.82	5	High
–	Jordanian consumer purchasing decision	4.20	0.50	–	High

5 Study Hypotheses Test

5.1 The Main Hypothesis

Stepwise Multiple Linear Regression Analysis was utilized to assess the validity of the main study hypothesis. However, prior to carrying out the test, we need to ensure that the multiple linear regression model is appropriate. This can be seen in Table 9 displayed here:

The findings presented in Table 9 demonstrate that the computed (F) value (193.545) surpasses the critical (F) value (2.37), and the statistical significance (.Sig) value of 0.000 is lower than the predetermined significance level ($\alpha = 0.05$). Consequently, the null hypothesis (H01) is rejected, and the alternative hypothesis (H1) is embraced, which asserts that there exists a statistically significant impact at the significance level ($\alpha = 0.05$) of the brand and its various dimensions (Brand Reputation, Brand Quality, Brand Loyalty, Brand Logo, and Perceived Brand Value) on the purchasing decision of Jordanian consumers for mobile phones in Amman. This affirms the reliability of the multiple linear regression model.

According to the findings presented in Table 10, the stepwise multiple linear regression approach can be employed to assess the influence of brand dimensions on the purchasing behavior of consumers in Amman, Jordan, specifically in the context of mobile phones.

The results in Table 10 indicate the following:

- The regression coefficients (β) for four brand dimensions (Brand Loyalty, Brand Reputation, Brand Quality, and Brand Logo) have been confirmed to be statistically significant, as indicated by their respective calculated (t) values (5.849, 5.275, 3.971, 2.525), all of which exceed the corresponding tabulated (t) value (1.96). Furthermore, the statistical significance (.Sig) values for these dimensions are below the significance level ($\alpha = 0.05$). Consequently, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted, demonstrating a statistically significant impact at the significance level $\alpha = 0.05$ for the aforementioned brand dimensions (Brand Loyalty, Brand Reputation, Brand Quality, and

Table 9 Analysis of variance table for regression, to test the validity of the multiple linear regression model regarding the study hypothesis

Source of variation (variance)	Sum of squares	Degrees of freedom	Mean square	Calculated (F) value	Statistical significance (.Sig)
Regression	70.761	4	17.690	193.545	0.000
Residual (error)	40.948	448	0.091		
Total	111.709	452	–	–	–

The critical F-value at degrees of freedom (4448) and a significance level ($\alpha = 0.05$) is 2.37

Table 10 Results of stepwise multiple linear regression analysis

Brand dimensions	Regression coefficients (β)	Calculated (t) value	Statistical significance	Standardized coefficients
Constant (β0)	0.612	4.452	0.000	-
Brand loyalty	0.279	5.849	0.000	0.317
Brand reputation	0.220	5.275	0.000	0.238
Brand quality	0.211	3.971	0.000	0.189
Brand logo	0.156	2.525	0.012	0.148

The critical t-value at degrees of freedom (448), a significance level ($\alpha = 0.05$) for a two-tailed test is 1.96, $R = 0.796$, and $R^2 = 0.630$

Brand Logo) on the purchasing behavior of consumers in Amman, Jordan, with regards to mobile phones.

- The dimension of Perceived Brand Value was omitted from the multiple linear regression model due to the findings of the stepwise multiple linear regression method, as its statistical significance value of 0.111 surpasses the predetermined significance level ($\alpha = 0.05$).
- With an adjusted coefficient of determination (R2) of 0.630, it can be inferred that the dimensions encompassed in the model, namely Brand Loyalty, Brand Reputation, Brand Quality, and Brand Logo, account for 63% of the variations in the purchasing decision of Jordanian consumers. The remaining 37% is attributed to other variables that were not considered in the multiple linear regression model.
- The standardized coefficients (Beta) of 0.317, 0.238, 0.189, and 0.148, respectively, suggest that enhancing the focus on each of the mentioned dimensions by one standard deviation unit will result in a corresponding increase in the purchasing decision of mobile phones by Jordanian consumers in Amman, with percentages of 31.7%, 23.8%, 18.9%, and 14.8%, respectively.

5.2 The Sub-hypothesis

Ho1

In order to assess the accuracy of the initial sub-hypothesis, a simple linear regression analysis was employed. Prior to conducting the analysis, it is imperative to ascertain the reliability of the simple linear regression model, as indicated in Table 11 provided.

According to the findings presented in Table 11, it is evident that the computed value of (F) (424.060) surpasses the critical value of (F) (3.84). Additionally, the statistical significance value (.Sig) of 0.000 is lower than the predetermined significance level ($\alpha = 0.05$). As a result, the null hypothesis H01 is rejected, and the alternative hypothesis H11 is accepted, signifying a statistically significant impact at the significance level $\alpha = 0.05$ for the brand dimension of Brand Reputation on

Table 11 Analysis of variance table for regression, to test the validity of the simple linear regression model related to the first sub-hypothesis

Source of variation (Variance)	Sum of squares	Degrees of freedom	Mean square	Calculated (F) value	Statistical significance (.Sig)
Regression	54.135	1	54.135	424.060	0.000
Residual (error)	57.574	451	0.128		
Total	111.709	452	–	–	–

The critical F-value at degrees of freedom (1451) and a significance level ($\alpha = 0.05$) is 3.84

the purchasing decision of Jordanian consumers for mobile phones in Amman. This confirms the credibility of the simple linear regression model.

The findings from the present study provide evidence that supports the utilization of the simple linear regression approach to assess the influence of the brand dimension of Brand Reputation on the purchasing behavior of consumers in Amman, Jordan, specifically in the context of mobile phone purchases, as indicated in Table 12.

The findings in Table 12 show the following:

- The regression coefficient (β) for the brand dimension of Brand Reputation demonstrates statistical significance, indicating that this dimension has a significant effect on the purchasing decision of Jordanian consumers for mobile phones in Amman. This is supported by the calculated (t) value of 20.593, which exceeds the tabulated (t) value of 1.96, and the statistical significance (.Sig) value for the brand dimension is lower than the significance level ($\alpha = 0.05$). Consequently, the null hypothesis H01 is rejected, and the alternative hypothesis H11 is accepted, confirming a statistically significant effect at the significance level $\alpha = 0.05$ for the brand dimension of Brand Reputation on the purchasing decision of Jordanian consumers for mobile phones in Amman.
- The coefficient of determination (R^2) value of 0.485 signifies that the dimension included in the model, Brand Reputation, accounts for 48.5% of the variations observed in the purchasing decision of Jordanian consumers. Conversely, the

Table 12 Results of simple linear regression analysis

Independent variable	Regression coefficients (β)	Calculated (t) value	Statistical significance	Standardized coefficient
Constant (β0)	1.470	11.024	0.000	–
Brand reputation	0.644	20.593	0.000	0.696
R	0.696			
R^2	0.485			

The critical t-value at degrees of freedom (451) and a significance level ($\alpha = 0.05$) for a two-tailed test is 1.96

remaining 51.5% can be attributed to other variables that were not incorporated into the simple linear regression model.

- According to the simple linear regression model, the standardized coefficient (Beta) value of 0.696 assigned to the dimension of Brand Reputation suggests that a one standard deviation increase in attention given to this dimension will result in a significant 69.6% enhancement in the purchasing behavior of Amman-based Jordanian consumers in relation to mobile phones.

H02

In order to assess the accuracy of the second sub-hypothesis, a simple linear regression analysis was employed. Prior to conducting the analysis, it is imperative to confirm the reliability of the simple linear regression model, as demonstrated in Table 13 provided.

The data presented in Table 13 demonstrates that the calculated F-value, which is (394.635), surpasses the critical F-value (3.84) associated with it. Furthermore, the statistical significance value (.Sig), which is (0.000), is lower than the predetermined significance level ($\alpha = 0.05$). As a result, the null hypothesis for the second sub-hypothesis (H02) is rejected, and the alternative hypothesis (H1) is accepted. This indicates a statistically significant impact of brand quality on the purchase decision of Jordanian consumers for mobile phones in the city of Amman, with a significance level of $\alpha = 0.05$. Therefore, the simple linear regression model employed in this study is validated.

With reference to the data presented in Table 14, the findings of this study provide support for the utilization of the simple linear regression approach in assessing the influence of brand quality on the purchasing behavior of Jordanian consumers in Amman specifically, in relation to mobile phone products.

The results in Table 14 indicate the following:

- The results highlight a statistically significant impact of the Brand Quality dimension on the purchasing behavior of consumers in Amman, Jordan, regarding mobile phones. The calculated (t) value of 19.865 exceeds the critical value of 1.96 at a significance level of $\alpha = 0.05$. Moreover, the statistical significance (.Sig)

Table 13 Analysis of variance table for regression, to test the validity of the simple linear regression model related to the second sub-hypothesis

Source of variation	Sum of squares	Degrees of freedom	Mean square	Calculated F-value	Statistical significance (.Sig)
Regression	52.132	1	52.132	394.635	0.000
Residual (error)	59.577	451	0.132		
Total	111.709	452			

The critical F-value at degrees of freedom (1451) and a significance level ($\alpha = 0.05$) is 3.84

Table 14 Results of simple linear regression analysis for assessing the influence of brand quality on the purchasing behavior

Independent variable	Regression coefficients (β)	Calculated (t) value	Statistical significance	Standardized coefficient
Constant (β0)	1.080	6.844	0.000	–
Brand quality	0.762	19.865	0.000	0.683
R	0.683			
R^2	0.467			

value is significantly lower than the specified significance level of 0.05. Consequently, the null hypothesis H02 is rejected, and the alternative hypothesis H12 is accepted, indicating a substantial influence of the Brand Quality dimension.

- The R^2 value, which stands for the coefficient of determination, is calculated to be 0.467. This value signifies that the Brand Quality dimension accounts for approximately 46.7% of the variances observed in the purchasing decisions made by Jordanian consumers in Amman when it comes to mobile phones. The remaining percentage, amounting to 53.3%, can be attributed to other factors that were not taken into consideration in the model.
- The coefficient (Beta) value of 0.683, which has been standardized, indicates that enhancing the emphasis on Brand Quality by one standard deviation unit will result in a notable enhancement in the purchasing decision of consumers residing in Amman, Jordan, specifically for mobile phones, by as much as 68.3%.

H03

In order to assess the accuracy of the third sub-hypothesis, a simple linear regression analysis was employed. Prior to conducting the analysis, it is imperative to confirm the reliability of the simple linear regression model, as indicated in Table 15 presented subsequently.

The analysis of the data presented in Table 15 reveals a significant relationship between brand loyalty and the purchase decision of Jordanian consumers for mobile phones in the city of Amman. This is supported by the calculated F-value of 522.400,

Table 15 Analysis of variance table for regression, to test the validity of the simple linear regression model related to the third sub-hypothesis

Source of variation	Sum of squares	Degrees of freedom	Mean square	Calculated F-value	Statistical significance (.Sig)
Regression	59.952	1	59.952	522.400	0.000
Residual (error)	51.757	451	0.115		
Total	111.709	452	–	–	–

The critical F-value at degrees of freedom (1451) and a significance level ($\alpha = 0.05$) is 3.84

which exceeds the critical F-value (3.84) at a significance level of $\alpha = 0.05$. Furthermore, the statistical significance value (.Sig) is considerably lower than the specified significance level (0.05). As a result, the null hypothesis of the third sub-hypothesis (H03) is rejected, and the alternative hypothesis (H13) is accepted, indicating a substantial impact of brand loyalty.

According to the results highlighted in Table 16, it is clear that the simple linear regression approach can effectively assess the influence of brand loyalty on the purchasing behavior of Jordanian consumers in Amman, specifically pertaining to mobile phones.

- The results highlighted in Table 16 demonstrate a statistically significant impact of brand loyalty on the purchasing decision of Jordanian consumers in the city of Amman. The calculated t-value for the regression coefficient (β) pertaining to this dimension is 22.856, surpassing the critical t-value (1.96) at a significance level of $\alpha = 0.05$. Moreover, the statistical significance value (.Sig) is considerably lower than the predetermined significance level (0.05). Consequently, the null hypothesis of the third sub-hypothesis (H03) is rejected, and the alternative hypothesis (H13) is accepted, signifying a substantial influence of brand loyalty.
- With an R^2 value of 0.537, it can be concluded that the dimension of brand loyalty accounted for 53.7% of the variances observed in the purchase decision of mobile phones among Jordanian consumers residing in Amman. The remaining 46.3% can be attributed to factors not incorporated within the model.
- According to the standardized coefficient (Beta) of 0.733, it can be inferred that a one standard deviation increase in brand loyalty will result in a significant enhancement, up to 73.3%, in the purchase decision made by consumers residing in Amman, Jordan, with regards to mobile phones.

Table 16 Results of simple linear regression analysis for the influence of brand loyalty on the purchasing behavior

Independent variable	Regression coefficients (β)	Calculated t-value	Statistical significance	Standardized coefficient
Constant (β0)	1.532	13.023	0.000	–
Brand loyalty	0.647	22.856	0.000	0.733
Correlation coefficient (R)	0.733			
Coefficient of determination (R^2)	0.537			

The critical t-value at degrees of freedom (451) and a significance level ($\alpha = 0.05$) for a two-tailed test is 1.96

H04

In order to assess the accuracy of the fourth sub-hypothesis, a simple linear regression analysis was employed. Prior to conducting the analysis, it is imperative to confirm the soundness of the simple linear regression model, as depicted in Table 17 provided.

Based on the findings displayed in Table 17, it is evident that the calculated F-value of 480.353 surpasses the critical F-value of 3.84. Additionally, the statistical significance value (.Sig) of 0.000 falls below the predetermined significance level ($\alpha = 0.05$). Consequently, the null hypothesis of the fourth sub-hypothesis (H04) is rejected, while the alternative hypothesis (H14) is accepted. These results indicate a statistically significant impact of the brand logo dimension on the purchasing decision of Jordanian consumers for mobile phones in the city of Amman. Thus, the validity of the simple linear regression model is confirmed.

According to the aforementioned information, it is possible to employ the method of simple linear regression to assess the influence of the brand logo dimension on the purchasing behavior of consumers in Amman, Jordan, specifically in relation to mobile phones. This analysis is further supported by the data presented in Table 18.

Table 17 Analysis of variance table for regression, to test the validity of the simple linear regression model related to the fourth sub-hypothesis

Source of variation	Sum of squares	Degrees of freedom	Mean square	Calculated F-value	Statistical significance (.Sig)
Regression	57.615	1	57.615	480.353	0.000
Residual (error)	54.094	451	0.120		
Total	111.709	452			

The critical F-value at degrees of freedom (1451) and a significance level ($\alpha = 0.05$) is 3.84

Table 18 Results of simple linear regression analysis, to measure the impact of the brand logo dimension on the purchase decision of Jordanian consumers for mobile phones in the city of Amman

Independent variable	Regression coefficients (β)	Calculated t-value	Statistical significance	Standardized coefficient
Constant (β0)	1.111	7.847	0.000	–
Brand logo	0.756	21.917	0.000	0.718
Correlation coefficient (R)	0.718			
Coefficient of determination (R^2)	0.516			

The critical t-value at degrees of freedom (451) and a significance level ($\alpha = 0.05$) for a two-tailed test is 1.96

- The analysis presented in Table 18 demonstrates a statistically significant impact of the brand logo dimension on the purchasing decision of Jordanian consumers in the city of Amman. The calculated t-value for the regression coefficient (β) associated with this dimension is 21.917, surpassing the critical t-value of 1.96 at a significance level of $\alpha = 0.05$. Moreover, the statistical significance value (.Sig) is considerably lower than the predetermined significance level of 0.05. As a result, the null hypothesis (H04) for the fourth sub-hypothesis is rejected, and the alternative hypothesis (H14) is accepted, providing evidence of a significant effect of the brand logo dimension on the purchasing decision.
- The model's brand logo dimension demonstrates a coefficient of determination (R2) of 0.516, signifying that it accounts for 51.6% of the fluctuations observed in the purchase decision of mobile phones among Jordanian consumers residing in Amman. The unexplained portion, amounting to 48.4%, can be attributed to additional variables that were not incorporated into the model.
- According to the standardized coefficient (Beta) of 0.718, it can be inferred that enhancing the focus on the brand logo dimension by one standard deviation unit will result in a considerable enhancement in the purchase decision of mobile phones among consumers in Amman, Jordan, with an estimated increase of 71.8%.

H05

In order to examine the accuracy of the fifth sub-hypothesis, a simple linear regression analysis was employed. However, prior to conducting the analysis, it is imperative to ascertain the soundness of the simple linear regression model, as depicted in Table 19 provided.

The findings presented in Table 19 demonstrate that the calculated F-value was below the critical F-value, and the statistical significance value (.Sig) exceeded the specified significance level ($\alpha = 0.05$). Based on these findings, the fifth sub-hypothesis (H05) was accepted, indicating that there is no statistically significant impact of the perceived value dimension of the brand on the purchase decision of Jordanian consumers for mobile phones in the city of Amman. Moreover, it appears that the simple linear regression model was inadequate in explaining the association

Table 19 Analysis of variance table for regression, to test the validity of the simple linear regression model related to the fifth sub-hypothesis

Source of variation	Sum of squares	Degrees of freedom	Mean square	Calculated F-value	Statistical significance (.Sig)
Regression	0.813	1	0.813	3.307	0.070
Residual (error)	110.896	451	0.246		
Total	111.709	452			

The critical F-value at degrees of freedom (1451) and a significance level ($\alpha = 0.05$) is 3.84

Table 20 Results of simple linear regression analysis, to measure the impact of the perceived value dimension on the purchase decision of Jordanian consumers for mobile phones in the city of Amman

Independent variable	Regression coefficients (β)	Calculated t-value	Statistical significance	Standardized coefficient
Constant (β0)	3.897	23.507	0.000	–
Perceived value	0.074	1.818	0.070	0.085
Correlation coefficient (R)	0.085			
Coefficient of determination (R^2)	0.007			

The critical t-value at degrees of freedom (451) and a significance level ($\alpha = 0.05$) for a two-tailed test is 1.96

between the perceived value of the brand and the purchase decision of Jordanian consumers (Table 20).

The study yielded results that indicate the absence of a statistically significant association between the perceived value aspect of the brand and the purchasing behavior of Jordanian consumers in Amman when it comes to mobile phones. This conclusion is drawn from the regression coefficient (β), which was found to be lower than the critical value, and the statistical significance value, which exceeded the predetermined significance level. Consequently, the acceptance of the fifth sub-hypothesis suggests that there is no statistically significant impact of the perceived value dimension of the brand on the purchase decision of Jordanian consumers.

6 Discussion of Study Hypotheses Results

- The findings from the application of multiple stepwise regression analysis validate the existence of a positive and statistically significant relationship between various brand dimensions (namely brand quality, brand reputation, brand loyalty, and brand logo) and the purchasing behavior of Jordanian consumers in the city of Amman when it comes to mobile phones. Among these dimensions, brand loyalty demonstrated the most substantial influence on the purchase decision, while the perceived value dimension did not exhibit a significant effect on the decision-making process.
- The findings validate the influential and statistically significant impact of the Brand Reputation aspect exclusively on the purchasing behavior of Jordanian customers when it comes to mobile phones within the urban setting of Amman.
- The findings demonstrate a notable and statistically significant impact solely attributed to the dimension of brand quality on the purchasing behavior of consumers in Amman, Jordan, specifically in relation to mobile phones.

- The findings pertaining to the third sub-hypothesis demonstrate a noteworthy and statistically significant impact of the brand loyalty dimension in isolation on the purchasing behavior of consumers in Amman, Jordan, specifically in relation to their choice of mobile phones.
- The findings suggest that the brand logo dimension, when considered in isolation, exerts a noteworthy and statistically significant impact on the purchasing behavior of Jordanian consumers residing in Amman with regards to mobile phones.
- The lack of significance of the perceived value dimension in influencing the purchase decision of mobile phones among consumers in Amman, Jordan, reflects its limited importance to users in this particular context.

6.1 Recommendations

- It is advisable to deepen the awareness of research participants about the perceived dimension of brand value, due to its importance, although it occupies the last place in their assessment scale.
- Recommendations should be aimed at improving study participants' understanding of certain items within the brand dimensions that ranked last, to ensure they have a correct and comprehensive understanding of these important aspects.
- Mobile phone users should make sure to pay attention to brands before making a purchase decision to ensure that they get the necessary information before purchasing.
- Users should regularly review bulletins and posters issued by telecommunications companies for new information that can help them make purchasing decisions.
- It is suggested that future research will focus on other variables as well as the use of different statistical indicators for a more comprehensive and accurate analysis of the data.

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Integration of Artificial Intelligence Along with AR and VR Ensure Prosperous Future in Digital Marketing



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Abstract If we consider 2023 was the year AI-driven marketing emerged, thanks to tools like ChatGPT, perhaps 2024 will be the year when companies start to use not only AI but also generative AI massively and fully integrate it into their digital marketing strategies. AI revolution has changed the direction of digital marketing as it enables customizable interactions, reduces repetitive operations, and offers valuable consumer data. Using chatbots, customized suggestions, and predictive behavior, it enhances user experience. Artificial Intelligence improves social media strategies through trend analysis, post scheduling, and reaction automation. Furthermore, it aids in the creation and optimization of content, including A/B testing and SEO. Forecasting and predictive analytics tools facilitate decision-making based on accurate information. AI also enhances the effective-ness of advertising campaigns by optimizing them through targeted pricing and placement. This paper shows and describes the current and potential relationship between two different scientific branches of marketing science and computer science. It expresses the interaction of digital marketing and artificial intelligence (AI) along with AR and VR and how these technologies could fit in several aspects in digital marketing area.

Keywords Digital marketing · Artificial intelligence · Augmented reality (AR) · Virtual reality (VR)

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1 Introduction

Online or digital marketing is the promotion of goods or services via digital channels, such as digital media, by means of information technology. As social media, email, search engines, and other websites to establish connections with [1, 2] sinesses and companies function. Employing technology to promote your brand by employing strategies like chatbots, influence marketing, content marketing, SEO, and more. Artificial intelligence powered sophisticated technologies are needed to identify customer purchase trends, and simplify consumer prediction and decision making for businesses, merchants, and marketers [3, 4]. By employing modern technologies including artificial intelligence (AI), the Internet of Things (IoT), and robotics, digital evolution can help businesses in addressing a variety of issues and offering extra value to their clients. Price Waterhouse Coopers figure out a thorough study to determine which technologies will be crucial in the future. The use of artificial intelligence (AI) has been selected as one of the eight most important technologies for the future, besides augmented reality (AR), drones, the Internet of [5] Things (IoT), robotics, 3D printing (also called additive manufacturing) and virtual reality (VR), out of man promising future technologies [6]. As a result, in order to navigate the challenges of the full digital transformation process, both private companies and government institutions alike are currently implementing artificial intelligence-based solutions throughout a range of industries.

2 Method

This research is a conceptual paper. The goal of research utilizing a literature review is to identify different theories, concepts, or guiding principles that are applied in a specific field. A literature review is a good approach so that a study has clear visibility into the topic that has been discussed. This provides a comprehensive overview of the subject under study. This study attempts to investigate the use of AI, AR, and VR in the marketing process to discuss digital marketing activities in different eras and areas.

3 Literature Review on Artificial Intelligence in Digital Marketing

If artificial intelligence (AI) is integrated with the realm of digital marketing, it could have a bright future. By assisting with product development, delivering more relevant advertising, and deciphering audience data patterns, artificial intelligence (AI) can enhance digital marketing [7]. It can be applied to marketing campaigns at many phases, such as planning, designing, implementing, and evaluating them,

in order to efficiently track the performance of advertising campaigns, under-stand customer behavior, and tailor marketing content [8]. Businesses can gain from using AI in digital marketing by using it to boost productivity, efficiency, and accuracy. This is because it allows for better consumer targeting [9, 10] and the creation of more successful campaigns with higher conversion rates [11]. Research on the use of AI and data analysis in digital marketing is expanding, with an emphasis on brand management, customer loyalty, and long-term financial and competitive results [12]. The systematic review papers offer a thorough summary of the current state of research in the field of digital marketing, emphasizing AI's promise for a profitable future [13].

4 Overview of Strategies in Digital Marketing

"In the twenty-first century, either e-commerce or no business," remarked Bill Gates, the man who is widely known as the father of the global Internet. Industries employ online channels that will help them flourish, and digital marketing encompasses all marketing strategies [6, 4] and methods that use an electronic device or the internet to present, promote, and sell goods or services. The most famous strategies of online marketing are.

4.1 Content Marketing

Content advertising is a showcasing process of framing and transferring meaningful, applicable and predictable material to pull by and get an obviously described group of bystanders—with the thing of driving salutary customer exertion [14, 15]. Content upgrading is an advertising system, covering a wide compass of strategies and procedures. Firstly, substance and data requirements inclinations of designedly characterized target gatherings of people are broke down. Then content is made to serve these musts in arrangement with predefined showcasing objects and finally the made substance is made affordable, enriched and used to serve guests and business destinations in every single conceivable home of promoting, PR, deals enablement and so forth in a deliberate and incorporated way.

4.2 Search Engine Optimization (SEO)

Improving a website's design is the art (or science) of making it easier for search engines to see it. This ought to be achievable by increasing the volume of watchwords a website positions for or the positioning of a certain keyword. There are many different SEO strategies available [2, 9], ranging from specialized on-site research

and optimization to content production, outreach, blogging, and third-party linking. The list of skills is endless and includes creativity, inquisitiveness, and specialized skills**.**

4.3 Search Engine Marketing (SEM)

Web crawler marketing encompasses a range of activities focused on increasing the visibility of your website when someone uses a web index [4, 16]. In the unlikely event that someone searches for your company online, it is crucial that your website appears prominently in the search engine results pages; otherwise, it will never provide your company with the boost that the current market demands.

4.4 Social Media Marketing (SMM)

Online networking management involves managing a brand's image across multiple social media platforms, not only tweeting. That could be LinkedIn or Pinterest, but it could also be Twitter or Facebook. It also involves combining customer support, which strengthens the base end of the pipe, with proactive business improvement, which helps fill the top level of the business channel [17, 18]. Over the past few years, web-based social networking administration has grown more sophisticated and sophisticated, offering a wider range of informal groups and more notable disclosure tools. Mix mark awareness, client management, creativity, [19, 16, 20] and familiarity with how internet-networking measurements relate to other marketing measurements were among the aptitudes.

4.5 Email Marketing

It is one the most-quick strategy of digital advertising is email marketing. Database displaying is one of its components. It involves segmenting your clientele and sending targeted, personalized messages at the appropriate times [11, 12]. Email marketing has been increasingly personalized as it has developed, with companies like Tesco and Amazon sending messages that are unique to each customer and dependent on the purchase of designs. This require arranging the skills from database research and customer relationship management (CRM) to crafting the right message, drafting messages in HTML, and analyzing the results to take action.

4.6 Mobile Marketing

As a result of the ever growing of smartphones and other smart devices, mobile marketers have developed mobile-optimized websites, applications, SMS marketing, [6, 21] and consumer location-based targeting, all of them are focusing on reaching and interacting with clients through their smart devices.

4.7 Pay-Per-Click (PPC)

The sponsored advertising is well known as paid search, PPC, or pay-per-click. These sponsored advertisements are typically displayed above or to the side of the "natural" indexed listings. Depending on the strength of the catchphrase you are offering, each click can cost anything from one penny to fifty pounds [22, 16, 23]. Certain phrases, like "auto protection," have the potential to reach astronomical levels of search traffic, therefore managing your PPC campaign is closely related to growing your budget to maximize profits. The skills necessary are also rather broad: in addition to having an acute eye for detail in information, one must also be creative when creating advertisements and seeing trends in the data.

4.8 Affiliate Marketing

Associate show casing bears similarities to web-based advertising, except that the website hosting the advertisement will only get payment if a transaction is completed. This will result in a larger installment and encourage the website owner to push the advertisement even more strongly [24, 25]. Flag marketing isn't the only use for subsidiary showing. Many partners make money through direct relationships, email marketing, or even opening online stores with affiliate products. According to one viewpoint, companies should confer with partners to determine the best possible arrangement that would provide the best possible advancement while ensuring that costs are maintained to a minimum to ensure high margins [18]. Transaction, organizing, and information analysis are examples of aptitudes.

5 Artificial Intelligence (AI)

Artificial Intelligence, known as (AI) could be defined as the imitation of human intellect in computers that are designed to imitate cognitive processes including learning, problem-solving, reasoning, perception [9], and decision-making [10]. AI

technologies allow robots to carry out simple to complicated tasks that traditionally need human intelligence.

5.1 Artificial Intelligence and How It is Related to Digital Marketing

Artificial Intelligence (AI) as a part of computer wisdom that focuses on the progress of systems able of achieving tasks that generally need mortal intelligence. These tasks contain literacy, logic, and problem-solving, perception, and decision- timber. AI encompasses a wide range of ways and technologies, including machine literacy, natural language processing, computer vision, and robotics [26]. In the environment of digital marketing, AI refers to the use of AI technologies and algorithms to optimize marketing strategies, enhance client gests, and ameliorate overall crusade performance. AI has a profound impact on digital marketing in colorful ways Data Analysis and perceptivity AI enables marketers to dissect vast quantities of data from multiple sources to gain precious perceptivity into consumer gests, preferences, and trends. By using AI- powered analytics tools, marketers can make data-driven opinions and knitter their strategies more effectively [17]. Personalization AI algorithms can dissect stoner data to produce substantiated gests for consumers. This includes delivering targeted content, product recommendations, and offers grounded on individual preferences and actions. Customization raises the liability of conversion while improving client engagement. Robotization AI-powered robotization tools streamline repetitious marketing tasks similar as dispatch marketing, social media operation, and announcement crusade optimization. By automating these tasks, marketers can save time and coffers while perfecting effectiveness and scalability [2, 9, 27]. Prophetic Analytics AI enables prophetic analytics by assaying literal data and relating patterns to read unborn issues [21, 25]. Marketers can use prophetic analytics to anticipate client requirements, optimize marketing juggernauts, and allocate coffers more effectively. Chatbots and Virtual sidekicks AI- driven chatbots and virtual sidekicks give instant client support and backing across colorful digital channels. These AI- powered results enhance client service, ameliorate response times, and increase client satisfaction. Hunt Machine Optimization SEO [22] AI algorithms play a pivotal part in SEO [15, 10], by assaying hunt machine algorithms and stoner geste to optimize website content and ameliorate hunt rankings. AI-powered SEO tools help marketers identify applicable keywords, produce high- quality content, and enhance overall website visibility, announcement Targeting and Optimization. AI algorithms optimize announcement targeting [16, 14] and crusade optimization by assaying stoner data, prognosticating stoner geste, and conforming announcement placements and bidding strategies in real- time. This results in further effective announcement juggernauts and advanced ROI for marketers [1]. Voice Search Optimization With the adding fashionability of voice-actuated bias and virtual sidekicks, AI- driven voice hunt optimization has come essential for digital marketers. AI

technologies similar as natural language processing help optimize content for voice hunt queries and ameliorate overall hunt machine visibility. In summary, AI has a significant impact on digital marketing by enabling marketers to dissect data more effectively [23, 20], epitomize gests for consumers, automate tasks, optimize juggernauts, and enhance overall performance. As AI technology continues to advance, its influence on digital marketing is anticipated to grow, shaping the future of the assiduity.

6 Augmented Reality and Virtual Reality: An Overview

Artificial intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), big data analytics, blockchain, cloud computing and Internet of Things (IoT) are the trends of 2024 and which are used excessively in businesses. These recant technologies, which we refer to as "digitalization". On one hand augmented reality (AR) overlays digital data, such as pictures [23, 20], videos, or three-dimensional (3D) models, on top of the actual environment In most cases, augmented reality (AR) systems use bias, like as smartphones, tablets, or AR glasses, to superimpose virtual content in real-time on the stoner's perspective of the outside world. AR operations offer immersive experiences and useful mileage in a variety of vibrant areas, spanning from gaming and entertainment to education [18, 15], retail, healthcare, and artificial training [24]. On the other hand, the term "virtual reality" describes a technology that immerses users in simulated environments for immersive experiences. Applications for this technology can be found in social media, education, training systems, entertainment, and medical simulations. Virtual reality systems combine innovative image processing techniques along with three-dimensional displays to give users a sensation of presence and immersion. The idea behind virtual reality is to create a realistically interactive digital world that improves users' technical and cognitive abilities [3, 18, 23]. Virtual reality websites that make use of WebVR and WebGL APIs to give users access to 3D settings for exploration using virtual reality headsets have been made possible by the advancement of virtual reality technology. As virtual reality, technology advances, new uses and discoveries are things in actual life could not be feasible [3, 19], and [15]. VR applications allow users to fully be taken in virtual experiences and storylines across enormous area of industries, including entertainment, gaming, education, training, simulation, treatment, architecture, and design.

6.1 Integration of Artificial Intelligence with AR and VR in Digital Marketing

One of the most productive directions for marketing in the future is the combination of Artificial Intelligence (AI) with Virtual and Augmented Reality (VR/AR) in digital marketing. According to research, this connection boosts customer engagement, speeds up decision-making, and changes marketing tactics to give customers immersive, interactive experiences [28, 29]. Businesses may improve consumer interactions; optimize marketing campaigns based on data-driven decisions, and extract useful insights from digital marketing analytics by combining AI models with AR and VR technologies [15, 20]. In addition to increasing the efficacy of marketing initiatives, this synergy supports the innovation and sustainability of the technology employed in digital marketing campaigns [30, 31]. The integration of AI, AR, and VR in digital marketing represents a revolutionary change toward more successful, tailored, and engaging campaigns. In addition, effective marketing strategies that bridge the gap between physical and digital worlds, ensuring a prosperous future for the field.

Some of the most recent research references have been used to support arguments and conclusions in new research. It provides a theoretical basis for the statements made by the researcher. By examining previous research, researchers can identify gaps in the literature that new research can fill. This helps in determining its relevance and uniqueness in its contribution to a particular field of knowledge. Here, the relevant research is related to the implementation of artificial intelligence, augmented reality, and virtual reality in digital marketing strategies (Table 1).

7 Future Directions and Potential of Integrating AI, AR, and VR in Digital Marketing

The current advancements in Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) technologies are revolutionizing various industries [15]. AI is enhancing healthcare by improving care quality and patient outcomes through data-driven algorithms. AR and VR are being increasingly utilized in industrial settings to boost productivity, accuracy, and economic benefits through IoT integration and sophisticated algorithms. The combination of AI and AR is seen as a significant direction for future industrial applications [10], with the potential to optimize production processes, workforce training, error handling, and packaging in smart industries [28]. Furthermore, AR is making strides in education, with studies showing that AR smartphone apps can enhance student learning motivation and engagement [14, 15]. In the transportation sector, AI, AR, and VR are crucial components [28, 29] of Autonomous Vehicles (AVs), aiding in understanding the environment and decision-making for full automation.

Table. 1 Literature of some recent researches using AI, AR and VR technologies

No	Author	Title	Year	Findings
1	Ari Apriani, Indra Sani, Lia Kurniawati, Rahmat Prayoga, Helena Louise Panggabean	The role of artificial intelligence (AI) and its benefits in digital marketing strategy	2024	AI empowers marketers to navigate the complexities of the digital landscape with greater precision and efficacy
2	Zahid Hussain, Muhammad Zain Shaikh	Role of technology in marketing: AI, AR and VR	2023	AI, AR, VR tech transform relations, customize products, services based on preferences
3	Qodirova Gulira'no Isroiljon qizi	The role of artificial intelligence in personalized marketing	2023	AI entry into a new era of customer engagement and business growth
4	G. Priyanga	The effects of artificial intelligence on digital marketing	2023	AI provides new opportunities for businesses to enhance their brand quality
5	Charles Ntumba, Samuel Aguayo, John Kamau Maina	Revolutionizing retail: a mini review of E-commerce evolution	2023	The future of e-commerce promises to be dynamic in using AI, AR and VR
6	Dr. Sajan M. George, Dr. B. Sasikala, Gowthami T, Dr. P. Sopna, Dr. M. Umamaheswari, Dr. D. Paul Dhinakaran	Role of artificial intelligence in marketing strategies and performance	2024	Emerging technologies such as augmented reality (AR), virtual reality (VR), are expected to shape the future landscape
7	Nan, Z., Yuping, C., and Kongjue, Z	The future of marketing analytics: trends and emerging technologies	2024	AI, AR and VR become a crucial instrument for marketers to gain a deeper comprehension of customer behaviour, preferences, and trends

Several companies have successfully integrated AI, AR, and VR in their digital marketing strategies. For example, here are some case Studies:

1. **IKEA**: IKEA uses augmented reality (AR) in their "IKEA Place" app, which allows users to preview how furniture and home decor items would look in their own space. By leveraging AR technology, IKEA enhances the shopping experience and helps customers make more informed purchasing decisions.
2. **Sephora**: Sephora, a cosmetics retailer, utilizes AR in their "Virtual Artist" feature on their mobile app. Customers can use the app to virtually try on different makeup products and explore various looks [3], 6], providing a more personalized and interactive shopping experience.
3. **Nike**: Nike has integrated AI and AR technologies in their "Nike Fit" feature, which uses computer vision and machine learning to help customers find the

right shoe size. Customers can use their smartphone camera to scan their feet, and the AI system recommends the ideal shoe size for a perfect fit.

4. **Snapchat**: Snapchat, a popular social media platform, has incorporated AR filters and lenses into their app, allowing users to overlay virtual elements on their photos and videos. Brands can leverage these AR features to create engaging and interactive ad campaigns, enhancing their digital marketing efforts.
5. **Volvo**: Volvo has used virtual reality (VR) technology to provide immersive experiences to potential car buyers. With their "Volvo Reality" VR app, customers can take virtual test drives, explore car features, and visualize the interior and exterior of Volvo vehicles.
6. **Starbucks**: Starbucks has implemented AI in their mobile app to offer personalized recommendations and rewards to customers. The app uses AI algorithms to analyze customer preferences and behaviors, providing tailored offers and suggestions to enhance the customer experience.
7. **Coca-Cola**: Coca-Cola has used AR in their marketing campaigns to engage customers. For example, they launched an AR-powered Christmas campaign where users could scan special cans with their mobile devices to unlock virtual Santa Claus characters and other interactive elements.
8. **Audi:** Audi has incorporated VR technology in their showrooms. Customers can wear VR headsets to experience virtual tours of the car models [6], explore the interior and exterior features, and even take virtual test drives.
9. **Amazon**: Amazon, a global e-commerce giant, exemplifies a highly successful implementation of AI in marketing. The company leverages AI algorithms for personalized product recommendations, creating a seamless and engaging shopping experience for users. The recommendation engine analyzes user browsing history, purchase behavior, and demographic data to predict individual preferences accurately. As a result, Amazon's AI driven recommendations contribute significantly to customer satisfaction and account for a substantial portion of the company's sales [6, 27]. The success of Amazon's personalized recommendation system highlights the effectiveness of AI in tailoring marketing strategies to individual customer needs

These instances demonstrate how companies in different sectors have effectively incorporated AI, AR, and VR in their digital marketing plans to boost customer interaction, improve shopping experiences, and increase sales. These companies have utilized these technologies to develop creative and engaging marketing campaigns that connect with their desired customer base. Companies measure the success of AI, AR, and VR integration in digital marketing through various metrics and KPIs [3, 6], 9]. They track engagement metrics like app downloads, time spent, and user feedback. Conversion rates show how many users become customers. Sales and revenue influence measures sales before and after implementation. Customer satisfaction is assessed through feedback surveys. ROI is analyzed by comparing costs with benefits. Social media metrics show the reach of campaigns. Each company may use different metrics based on goals, industry, and audience. Customized metrics help evaluate the effectiveness of AI, AR, and VR in digital marketing strategies.

8 Ethical Considerations and Building Consumer Trust in AI, AR, and VR Marketing

Incorporating artificial intelligence, augmented reality, and virtual reality into digital marketing raises ethical issues. Included are topics such as consumer privacy, data security, manipulation and persuasion, informed consent, algorithmic bias, addiction and overconsumption, and social and economic impact [3, 5]. It is important for companies to focus on safeguarding consumer privacy, ensuring data security, preventing manipulation, obtaining consent, addressing bias in algorithms, and encouraging responsible use of immersive technologies [7, 19]. Some tasks that must be completed include performing privacy impact assessments, informing users, and enforcing ethical principles. Collaboration among technology developers, marketers, regulators, and consumer groups can help achieve the optimal balance between innovation and ethical considerations in digital marketing.

9 Conclusion

Digital marketing and artificial intelligence (AI) integrating with AR and VR must work together to ensure a profitable future. Businesses may optimize campaigns, improve overall efficiency, tailor content, and improve consumer experiences by incorporating AI technologies into their digital marketing efforts. Through data-driven decision-making, targeted advertising, and repetitive task automation made possible by this integration, market competitiveness and return on investment are raised. This supports the notion that combining AI with digital marketing side by side with AR and VR will stimulate growth and innovation, which will ultimately help companies operating in the digital market have a prosperous future.

10 Recommendations

Companies should embrace AI, AR, and VR technologies to customize their products, services, and messages to target audiences, based on specific preferences and needs. This can enhance customer-brand relationships and improve brand experiences. Marketers can leverage augmented reality (AR) to engage customers in personalized and relevant ways, leading to increased brand recognition and consideration. AI applications can be utilized in marketing to analyze data, detect fraud, and provide world-class customer relationship management, giving companies a competitive advantage. Businesses should consider the potential of VR advertising to bridge the gap between experience and action, offering virtual experiences that pro-mote products and services. Marketers should explore the use of AI, AR, and VR to create deeply customized and relevant experiences for customers, which may

not be possible through other channels, leading to increased customer engagement and satisfaction. Therefore, we advise companies, organizations out there to think out of the box, I think if we steer that productivity revolution very actively, marketers will invest their time in what they do best with more personalized content and ideas that are more productive. I believe not only marketing but also every function out there that is being impacted by this productivity revolution, need to grow one fast. Well this means that they need to strategically reskill and recognize to embed people that can build, use and diffuse predictive AI tools in the heart of decision-making. I intend to say, for marketing, building teams of marketing data scientists, marketing data engineers that build solutions.

11 Future Study and Directions

Future directions in integrating AI, AR, and VR in digital marketing include enhanced personalization, immersive social commerce, AI-driven content creation, ethical AI marketing frameworks, social impact and sustainability efforts, and multisensory experiences. Research opportunities include exploring the boundaries of personalization, leveraging social networks for immersive shopping experiences, analyzing the impact of AI content creation on creativity, developing ethical AI frameworks, promoting social causes through technology, and enhancing user engagement through multisensory cues.

Future research can focus on seamlessly integrating AI, AR, and VR experiences across digital marketing channels like websites, mobile apps, and social media. Real-time analytics powered by AI can provide insights for dynamic decision-making, and further exploration is needed to optimize marketing campaigns [20, 10]. Understanding user preferences in the context of AI, AR, and VR will be crucial for interface design. Integration with IoT devices presents exciting possibilities for personalized marketing experiences. These areas offer opportunities for future research in AI, AR, and VR-driven marketing strategies.

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Business Intelligence in Construction Companies as a Competitive Advantage: Insights from a Literature Review

Qais I. Tanbour

Abstract The literature review delves into the realm of business intelligence (BI) in construction companies as a competitive advantage. The study focuses on exploring the potential of BI tools as a strategic resource for gaining a competitive edge in the construction industry. By defining BI tools and their relevance to construction companies, the review highlights how these tools can contribute to enhancing operational efficiency, decision-making processes, and overall project management. One of the key insights presented in the review is the transformative power of BI in enabling construction firms to make informed decisions, strategically plan their operations, and optimize their business processes. By leveraging BI tools effectively, companies can position themselves ahead of the competition and achieve long-term success in a dynamic and competitive market environment. The review emphasizes that BI is not just about winning projects but also about building a sustainable and thriving construction company. However, the review also sheds light on the challenges and limitations faced by construction companies when implementing BI solutions. Data quality and integration issues emerge as significant hurdles, with the need to ensure accuracy, consistency, and reliability of data from various sources such as schedules, budgets, material costs, and worker productivity. The lack of data integrity between sources poses a challenge for BI tools to provide meaningful insights for decision-making. Moreover, resistance to change within organizations is identified as another major challenge during the implementation of BI solutions. The review highlights how employees may resist adopting new technologies or methodologies, disrupting established workflows and processes. Overcoming this resistance and fostering a culture of data-driven decision-making are deemed essential for maximizing the benefits of BI in the construction industry. The review also touches upon the cost implications and expertise required for implementing BI solutions, emphasizing that these factors can pose challenges for construction companies. By addressing these challenges and leveraging BI tools effectively, construction firms can enhance their competitiveness, improve project outcomes, and drive sustainable growth in the industry.

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Keywords Business intelligence · Construction company · Construction project management · Competitive advantages

1 Introduction

The concept of measuring competitiveness in the business and competition literature, spot the light on the significance of understanding and assessing competitiveness in the construction sector [1]. This mean that construction company compete in competitive market where factors such as project delivery, cost efficiency, quality, and innovation are very important in determining success and market positioning.

Furthermore, the literature discusses the subject of competitive intelligence's role in strengthen project management endeavors, emphasizing the imperative for construction firms to remain abreast of market dynamics, competitor tactics, and industry trends to gain a competitive edge. Through cautious monitoring the competitive market, these firms can detect opportunities, anticipate barrier, and enact strategic maneuvers to augment market competitiveness and foster sustained growth [1].

In essence, the competitive market of the construction industry is affected by several factors, influenced by factors such as technological advancements, regulatory changes, market demand, and the competitive strategies of industry players. Construction companies must navigate this competitive market by adopting data-driven insights, adopting innovative practices, and focusing on operational excellence to succeed in a challenging and dynamic industry environment [2].

The escalating significance of data-driven decision-making in construction projects mirrors a larger trend within the industry, where the utilization of data and analytics is becoming increasingly pivotal in steering informed decisions and elevating project performance. Integrating business intelligence into strategic management underscores its profound impact on organizations, highlighting the intrinsic value of data-driven methodologies in refining project results and attaining competitive edges [3].

Data-driven decision-making in construction projects encompasses the methodical gathering, scrutiny, and elucidation of project-centric data to extract actionable understandings and enhance project results. Through the utilization of data drawn from diverse origins including project management systems, IoT devices, sensors, and historical project data, construction enterprises can attain a more profound comprehension of project intricacies, discern patterns, and anticipate prospective hazards and openings [2].

Embracing data-driven decision-making in construction projects unlocks a myriad of advantages. Initially, it equips construction enterprises with tools to refine project planning and scheduling through the utilization of data analytics, thereby optimizing resource allocation, streamlining workflows, and augmenting project efficiency. Secondly, data-driven insights play a pivotal role in risk management, enabling early detection of potential issues and facilitating proactive measures to mitigate risks, thereby safeguarding project success. Moreover, data-driven decision-making

empowers construction firms to monitor project performance in real-time, track key performance indicators, and enact timely adjustments to ensure the attainment of project objectives [4].

Additionally, data-driven decision-making protect evidence-based decision-making frameworks, alleviates uncertainties, and enhances transparency within project management initiatives. Through the integration of data-driven methodologies, construction enterprises can ignite innovation, cultivate heightened collaboration among project stakeholders, and ensure project delivery aligns with stringent quality standards, predefined timelines, and budgetary parameters [5].

The literature underscores the utmost significance of data-driven decision-making in construction projects, seamlessly aligning with current industry trends that prioritize leveraging data and analytics to enhance project outcomes, reinforce operational efficiency, and gain competitive edges within the construction domain [6].

The imperative of data-driven decision-making in construction projects is further underscored by the dynamic and fiercely competitive nature of the construction sector. The influence of business intelligence on organizational dynamics when integrated into strategic management underscores the pivotal role of leveraging data for informed decision-making. Moreover, the role of data collection, analysis, and validation in meeting information requirements and enhancing project outcomes through diverse information sources is underscored [3].

Furthermore, the advantages of data-driven decision-making in construction projects, including the increase of project planning, risk management, and performance monitoring through the analysis of project-specific data, are emphasized [3]. Thus, maintaining competitiveness within the industry.

Scope of the Literature Review: This literature review concentrates on probing the potential of using business intelligence tools as a resource for gaining competitive edge for construction company by starting on the definition of BI tools and how to contribute with construction company also the literature reviewed about construction company and how they compete in construction industry market and how and what resources that can be used to cover its deficit or to put the one step forward from their competition.

Also, this literature will discuss the challenges and future orientation in implementing BI tool in the construction companies and lastly, we will discuss where future research must go through to cover the uncovered aspect of implementing BI tools at construction company.

2 Literature Methodology

The methodology outlined describes the process used to conduct a literature review on the use of business intelligence tools as a strategic resource to gain competitive advantages for construction company. Here's a breakdown of the key steps:

1. Search Engine and Publication Date: The literature review utilized Google Scholar as the search engine and focused on papers published after 2018. This approach ensured that the review centered on the most recent research in the field, capturing the latest developments and insights related to use of business intelligence tools as a strategic resource to gain competitive advantages for construction company.
2. Search Terms: Specific search terms such as "Business intelligence," "construction company," "competitive advantages," and "Project based company" were employed to identify relevant literature. By using these targeted terms, the review aimed to gather comprehensive and specific information related to the application of business intelligence at construction company.
3. Screening Process: The search results were screened based on their relevance to the research topic and their publication date. This step involved assessing the papers to ensure they were pertinent to the focus of the review and met the requirement of being published after 2018. This screening process aimed to select high-quality, recent literature for inclusion in the review.
4. Inclusion Criteria: Only peer-reviewed papers published in reputable journals were included in the review. This criterion ensured that the selected literature met rigorous academic standards, enhancing the credibility and reliability of the review's findings.
5. Analysis and Organization: The selected papers were read and analyzed to identify key themes and findings related to the use of business intelligence at construction company. These themes, such as construction company, project-based company, and competitive advantages, formed the basis for organizing the literature review into distinct sections. This approach facilitated a structured presentation of the implementation of business intelligence at construction company to gain a competitive advantage.
6. Highlighting Benefits and Challenges: The review also emphasized the potential benefits and challenges associated with the use of business intelligence at construction company. By addressing both the advantages and limitations, the review provided a balanced assessment of the technology's impact on the construction companies.
7. Need for Further Research: Lastly, the review acknowledged the need for continued research and development to address the challenges and limitations identified. This recognition of ongoing areas for exploration and improvement underscored the dynamic nature of the field and the potential for future advancements in implementation of business intelligence at construction companies.

The methodology employed a semi systematic and comprehensive approach to identify, analyze, and present the latest research using business intelligence at construction company to gain a competitive advantage, contributing to a well-rounded understanding of the topic.

3 Business Intelligence in Construction

Imagine construction projects where everything runs like clockwork. Budgets stay within assumption, delays are a thing of the past, and you can spot problems before they even happen. This isn't a dream for any construction project manager—it's the future powered by a tool called Business Intelligence (BI) [5, 7].

Think of BI as a super-powered organizer for your construction company. It takes all the information you collect every day—schedules, budgets, materials, and more—and turns it into something amazing: clear and helpful insights. It's like having a mystery eye that can guide you towards better project management, lower costs, fewer risks, and even happier clients [8].

Here's how BI can completely change the way you build:

From Messy Data to Smart Decisions: BI isn't just about gathering information. It's about going deep and finding patterns and trends you might miss on your own. Imagine uncovering ways to save money on materials, or spotting potential delays before they happen. BI can be your secret weapon for making smarter choices, quicker than ever before [9].

Seeing is Believing: This is where BI's magic trick comes in—data visualization. It takes all those numbers and figures and turns them into easy-to-understand infographic charts. Suddenly, everyone involved in the project, from the managers to the clients, can see exactly what's going on. This clear picture leads to better communication and teamwork, which means a smoother project from start to finish.

More Than Just Saving Money: Sure, BI is great at helping you save money on projects by keeping track the expenses (and that's definitely a plus!). But it can do so much more. BI can help you identify potential safety hazards before they become accidents, keep your clients happy by always giving them updates, and build a reputation for being reliable and efficient [1, 10].

Think of BI as your own personal advisor, always looking at the data and whispering helpful tips in your ear. It empowers you to make decisions based on real information, use your resources wisely, and navigate the complexities of any construction project with confidence.

All the industries in the world including the construction industry are moving towards a more digital future, and BI is no longer an optional extra—it's becoming essential for success at the information age. So, implementing BI tools at construction company are the perfect way to unlock the power of BI. By implementing BI systems that focus on collecting, analyzing, reporting, and visualizing data, you can take your construction company to the next level and achieve success in a competitive market [3].

4 Competitive Advantage Through BI

The construction industry is a competitive landscape, and having a valuable resource is crucial for success. That's where Business Intelligence (BI) comes in. It's like a secret weapon that helps construction companies gain a clear advantage [11, 12].

Here's how BI helps you outsmart the competition:

Data Drives Decisions: Imagine having a crystal ball that shows the company how to win bids, allocate resources perfectly, and plan projects flawlessly. BI does just that! By analyzing competitor info, market trends, and project performance, BI gives you valuable insights to make data-driven decisions at every stage. So the companies will never have to guess again—BI empowers construction company to make smart choices that lead to winning projects [5, 13].

Spotting Trends, Boosting Efficiency: BI tools are powerful so they sniff out patterns and trends hidden in your data. like showing how Did a certain approach save time on past projects. BI can reveal these hidden gems. By analyzing historical data, BI helps the companies identify areas for improvement and optimize their workflow. This translates to better efficiency, higher productivity, and a clear edge over competitors who are still relying on outdated methods [5, 12].

In a substantially, BI gives you the power to make informed decisions, plan strategically, and streamline your operations. It's like having a built-in advisor constantly analyzing data and whispering winning strategies for a company. By leveraging BI tools effectively, the company can stay ahead of the curve, optimize their construction business, and achieving long-term success in a competitive market [5].

Remember, BI isn't just about winning projects—it's about building a sustainable and thriving construction company.

5 Challenges and Limitations

Based on the information provided in the literature, the challenges faced by construction companies when implementing Business Intelligence (BI) solutions can be significant. These challenges can impact the successful adoption and utilization of BI tools within the construction industry [14, 15].

Data quality and integration issues:

The biggest hurdle construction companies face when implementing BI is getting their data in order [2]. Construction projects are data factories, pumping out information from schedules, budgets, material costs, worker productivity, and more. The catch? All this data needs to be accurate, consistent, and reliable to be truly useful for BI.

The problem is, this data comes from multiple sources—different software programs, spreadsheets, and even handwritten notes. Wrangling all this information into one system that paints a clear picture of a project for analysis can be a real challenge, and it takes time. This non integrity between data sources makes it

tough for BI to do its job: giving you the insights you need to make smart decisions [16, 17].

Resistance to change within the organization:

Resistance to change is another significant challenge that construction companies encounter during the implementation of BI solutions. Employee for any company will almost not like the new technology because they used to do the old ones, and introducing BI tools can disrupt established workflows and processes. Resistance from staff members who are hesitant to adopt new technologies or methodologies can hinder the successful implementation and utilization of BI within the organization. Overcoming this resistance and fostering a culture of data-driven decision-making is essential for maximizing the benefits of BI in the construction industry.

Cost and expertise required for implementing BI solutions:

The cost contribution with implementing BI solutions and the expertise required to effectively utilize these tools can subject challenges for construction companies. Investing in BI technologies, infrastructure, and training programs can very expensive, especially for smaller firms with limited resources [2]. Additionally, acquiring the necessary expertise to implement, configure, and maintain BI systems can be a barrier for organizations lacking in-house technical skills. Ensuring that employees are adequately trained to use BI tools and interpret data insights is crucial for realizing the full potential of BI in driving competitive advantage within the construction sector.

Lastly, overcoming these challenges through effective data management strategies, organizational change management, and investment in training and development can enable construction firms to leverage BI effectively, make informed decisions, and gain a competitive edge in the industry [18, 19].

6 Future Trend and Opportunity

Based on the information provided in the literature, the evolution of Business Intelligence (BI) in the construction industry is expected to follow several key trends and opportunities that can shape the future of data-driven decision-making and competitive advantage within the sector.

Integration of Big Data and advanced analytics:

The future of BI in the construction industry is likely to involve the integration of Big Data and advanced analytics capabilities. With the increasing volume and variety of data generated by construction projects, including sensor data, IoT devices, and project management systems, construction companies can harness Big Data technologies to extract valuable insights and trends. By combining traditional BI tools with advanced analytics techniques such as predictive modeling, machine learning, and data mining, construction firms can gain a deeper understanding of project performance, identify patterns, and make more informed decisions to optimize operations and mitigate risks.

The rise of AI and machine learning for predictive insights:

Artificial intelligence (AI) and machine learning are about to become the ultimate construction BI sidekicks. Think about AI algorithms studying past projects to forecast future outcomes, like identifying potential delays before they even disrupt your schedule. This kind of foresight empowers construction companies to be proactive, taking preventative measures and optimizing workflows. With AI as a partner, construction firms can anticipate challenges, continuously improve processes, and deliver projects with laser focus.

Emerging opportunities for construction companies to leverage BI for further competitive advantage:

The evolving landscape of BI presents emerging opportunities for construction companies to leverage data-driven strategies for further competitive advantage. By embracing BI tools that incorporate real-time data analytics, visualization techniques, and collaborative platforms, construction firms can enhance transparency, communication, and decision-making processes. Leveraging BI for benchmarking performance, identifying market trends, and optimizing resource utilization can enable construction companies to differentiate themselves in a competitive market environment, deliver projects more efficiently, and meet client expectations effectively.

In conclusion, the future of Business Intelligence in the construction industry is expected to revolve around the integration of Big Data and advanced analytics, the rise of AI and machine learning for predictive insights, and emerging opportunities for construction companies to leverage BI for further competitive advantage. By embracing these trends and technologies, construction firms can unlock new possibilities for innovation, efficiency, and sustainable growth in a dynamic and data-driven industry landscape [10, 20–22].

7 Conclusion:

In conclusion, this paper we presented a brief discussion of the Business Intelligence stands as a cornerstone for construction companies seeking to excel in a competitive market landscape. However, while the specific mention of Business Intelligence as a key tool for competitive advantage is not explicitly provided in the literatures, the importance of data-driven decision-making in construction projects is highlighted throughout various sections, emphasizing the value of leveraging data and analytics to optimize project outcomes and drive operational excellence in the construction industry. The strategic utilization of BI tools enables firms to monitor projects in real-time, employ predictive analytics for risk management, optimize supply chain operations, and track key performance indicators for continuous improvement. Embracing BI not only enhances operational efficiency and project success but also positions construction companies to adapt to industry trends, capitalize on emerging opportunities, and secure a sustainable competitive advantage [6, 8].

As construction companies navigate the dynamic challenges and opportunities within the industry, the strategic integration of Business Intelligence remains imperative for driving innovation, fostering growth, and maintaining a competitive edge. By harnessing the power of BI technologies and insights, construction firms can make data-driven decisions, optimize resource allocation, and enhance project outcomes, ultimately positioning themselves as industry leaders in a rapidly evolving construction landscape [11].

Business Intelligence (BI) plays a pivotal role as a strategic tool for construction companies aiming to attain a competitive edge in the industry. By leveraging BI effectively, construction firms can convert data into valuable insights, facilitate informed decision-making, and optimize project performance. The incorporation of BI into construction project management processes empowers companies to enhance efficiency, mitigate risks, and elevate overall project outcomes [7].

Finally, this field need further more future research to cover all its pivot to be an acceptable tool for company to adopt and these pivots can be summarized by:

Ethical Considerations in BI Implementation: There is a need for research focusing on the ethical implications of Business Intelligence implementation in construction companies. Exploring issues related to data privacy, security, and transparency in BI usage could help companies navigate ethical challenges and ensure responsible data practices in the construction sector.

Impact of AI and Machine Learning: Future studies could delve into the impact of Artificial Intelligence (AI) and Machine Learning algorithms on BI applications in construction. Understanding how AI-driven predictive analytics and automation tools can optimize project planning, risk assessment, and performance evaluation may offer new avenues for enhancing competitiveness and innovation in the industry.

BI Adoption in Small and Medium-Sized Enterprises (SMEs): Research could focus on the adoption of Business Intelligence tools in small and medium-sized construction enterprises. Exploring the challenges, benefits, and best practices for BI implementation in SMEs could provide valuable insights for enhancing the competitiveness and sustainability of smaller construction firms.

Long-Term Effects of BI on Project Success: Investigating the long-term effects of Business Intelligence utilization on construction project success and company performance could be a fruitful area for future research. Analyzing how BI-driven decision-making impacts project outcomes, client satisfaction, and overall business growth over extended periods can offer valuable insights for strategic planning and performance evaluation [23].

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Banks Profitability Determinants: Empirical Evidence from Developing Countries

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Abstract This paper examines the profitability bank determinants in developing countries. Using balanced panel data from 22 operational commercial banks in Palestine and Jordan between 2011 and 2021, a linear model between the theoretically stated characteristics of commercial banks and their profitability is computed. The study reveals that the non-debt tax shield, tangibles, inflation, capital sufficiency, and leverage of commercial banks in Palestine and Jordan have a negative impact on their return on asset. By delivering actual evidence from a developing nation environment, the paper contributes to the body of knowledge and provides guidance to bank managers and policymakers on how to improve financial performance in emerging markets. The findings highlight how crucial it is to keep up strict regulatory frameworks and responsible management techniques in order to guarantee the stability and financial success of banks in these countries.

Keywords Banks' profitability · Developing countries

1 Introduction

A bank functions as a pivotal institution dedicated to managing financial and monetary activities, encompassing deposits, loans, investments, and currency exchange. Its multifaceted roles are integral to the economy, encompassing the provision of essential financial services, fostering economic expansion, optimizing resource allocation, minimizing transaction expenses, fostering liquidity, facilitating investment economies of scale and reducing financial risks. Given the critical significance of this sector, ensuring its sustained effectiveness is imperative.

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Optimal financial performance not only enhances the market value of a particular organization but also fosters industry-wide growth, thereby contributing to the overall economic success. By driving efficiencies, fostering innovation, and enhancing competitiveness, superior financial performance plays a pivotal role in advancing not just individual firms but the collective prosperity of entire economies [1, 2].

Bank performance has been a significant concern for several decades because of its strong connection to the economy [3]. As a form of financial middleman, banks are absolutely necessary for the continued growth and development of an economy [4]. Banks constitute a cornerstone of any country's financial system and actively participate in its financial markets. In an era marked by globalization, the repercussions of a significant bank failure transcend national borders. As the global financial crisis of 2008 demonstrated, the consequences of such failures can spread quickly and widely across international borders in addition to impeding development and economic growth inside the afflicted nation [5].

Several studies that attempted to investigate profitability of bank determinants in developing countries [e.g., 6–9. Although these studies focused on the bank's profitability determinants in emerging countries, however determinants of bank profitability in developing countries of Palestine and Jordan receive less attentions. Palestine has particular political and economic circumstances [10–12] in addition to high rates of unemployment [13]. Jordan has tremendous difficulties and economic problems due to a variety of causes, including as high unemployment, strain on natural resources, and regional instability [14]. Furthermore the banking sector is considering as the largest financial intermediaries and play an important role in the economic cycle in these countries [15].

This paper has the potential to greatly assist decision-makers in improving financial and managerial effectiveness as well as preventing underperformance. Through figuring out what the main variables affecting banks' profitability are, this study can furnish valuable insights for strategic decision-making aimed at enhancing overall bank performance. Moreover, the findings of this research can serve as a comparative framework for other scholars, facilitating cross-country comparisons between the variables affecting bank profitability in Jordan, Palestine, and other nations.

The rest of this paper is structured as flowing: the next section shows a background and literature review. Section 3 delineates our chosen variables and research methodology, elucidating the framework within which our analysis is conducted. In Sect. 4, we present the findings derived from our empirical analysis, shedding light on the factors that significantly impact bank profitability. These findings are then synthesized and interpreted to draw meaningful conclusions in Sect. 5. Additionally, we offer actionable suggestions based on our findings, providing practical recommendations for stakeholders in the banking industry to optimize performance and foster sustainable growth.

2 Literature Review

Academic scholars have focused a lot of emphasis on bank profitability determinants since the 1970s. Several studies focused on the bank specific factors [4, 9] while other studies seeks to examine the macroeconomic determinants of bank performance [16, 17]. A research by Kanapiyanova, Faizulayev [18] intends to investigate the factors that influence banking stability in emerging nations, with a particular emphasis on social and governmental responsibility factors. Ren et al. [19] have considered the effects of digital transformation on bank profit efficiency, while Djalilov and Piesse [6] Analyze the variables that affect bank profitability in the early transition countries of Central and Eastern Europe (CEE) and the late transition countries of the former USSR. The majority of these studies were conducted on private conventional banks. Recent studies have focused on Islamic banks [20, 21]. Other studies have focused on the public sector banks [22].

The factors influencing banks' profitability hold significant theoretical and practical relevance. Despite this, limited research has delved into unraveling the precise determinants of profitability within the banking sector. Moreover, existing studies present a mosaic of findings, lacking consistency. This study aims to scrutinize key factors highlighted in previous research [2, 23–26]. Previous studies have mostly focused on internal variables like size, liquidity, leverage, and that are under management's authority. Furthermore, the effects of outside factors on the profitability of banks have been examined, such as inflation and GDP growth. The non-debt tax shield, tangibility, and bank capital adequacy are also included in this analysis as potential contributing factors.

2.1 Non-debt Tax Shield (NDTS)

The use of non-debt financing as a tax shield is a fundamental concept in finance theory. Essentially, when a company takes on debt, it incurs interest payments which are tax- deductible expenses. This implies that the business can lessen its tax burden by reducing its taxable revenue by deducting the interest it has paid on its loan [27].

The non-debt tax shield (NDTS) refers to the tax benefits that companies, including banks, can obtain without increasing their debt level. By utilizing various provision and deductions available in the tax laws, companies can reduce their taxable income and increase their after-tax profits. The profitability of banks may benefit from the non-debt tax shield [27].

Based on Feld, Heckemeyer [27] in this paper the authors investigate the factors that influence corporate tax avoidance specifically within the banking sector. Through empirical analysis, the authors examine various determinants such as bank size, profitability, leverage, regulatory environment, financial structure, and international operation to understand the dynamics of tax planning strategies employed by banks. The study sheds light on how banking regulations, tax low, and financial structures

impact tax avoidance behavior, providing valuable insights into the complexities of tax management within the banking industry. For instance, Graham et al. [28] proposes analyzing the conservatism of debt policies by evaluating if loss carryover, investment tax credits, and depreciation are included in non-debt tax shields.

It is crucial to remember that the effect of non-debt tax shields on bank profitability can differ based on a number of variables, including the bank's size, the applicable tax jurisdiction, and the particular tax laws. Additionally, tax laws and regulations are subject to change, requiring banks to adopt their strategies accordingly to optimize their tax positions and profitability.

Overall, non-debt tax shields provide opportunities for banks to reduce their tax burdens and increase their after- tax profits. By effectively utilizing these tax benefits and implementing sound tax planning strategies, banks can enhance their profitability in a tax efficient manner [29]. Thus, the following hypothesis is formulated:

H_1: Bank profitability in Palestine and Jordan has a relationship with Non-Debt tax shield.

2.2 Tangibility

Previous research has repeatedly demonstrated a favorable correlation between profitability of a company and the assets tangibility. Ahmeti and Iseni [30] found that their findings validated the theory regarding the connection between physical assets and the performance of insurance businesses in Kosovo. The positive tangible asset coefficient, which shows a positive link between tangible assets and the success of insurance enterprises, lends credence to their theory. However, it is noteworthy that this relationship deemed statistically insignificant [28]. Additionally, Dhiab's [29] analysis revealed a favorable connection between profitability and tangibility in the Saudi insurance market. Isayas [2] recognized a positive association between tangibility and profitability in banks within the Ethiopian context.

Numerous studies have revealed a negative association between tangibility and business profitability. For instance Yadav et al. [31] shown that in the Asia-Pacific markets, tangibility and profitability had a negative connection. Furthermore, Gharaibeh and Khaled [32] determined that, particularly in the Jordanian context, elements that negatively affect profitability include debt to assets, company risk, and tangible assets. As a result, the second hypothesis is:

H_2: Bank profitability in Palestine and Jordan has a relationship with tangibility.

2.3 Capital Adequacy

Of the numerous research projects examining the connection between capital sufficiency and organizational profitability, Weersainghe and Perera [33] revealed a negative relationship between profitability and capital adequacy. Also Serwadda and Isah [34] found that there was a negative correlation between profitability and capital

sufficiency. On other hand Căpraru and Ihnatov [24] show that in a selected Central and Eastern European nations, capital adequacy and profitability were positively correlated [24]. Also Menicucci and Paolucci [25] found that the European banking industry's capital adequacy and profitability were positively correlated. Farkasdi et al. [35] found that profitability and capital adequacy from Germany were positively correlated. Accordingly, the third hypothesis follows:

H_3: Bank profitability in Palestine and Jordan has a relationship with Capital adequacy.

2.4 Size

Of the numerous research examining the connection between corporation profitability and size, Derbali [36] carried a research that showed a strong correlation between Moroccan banks' size and profitability. Koroleva et al. [37] found that there was a favorable correlation between Chinese enterprises' profitability and size. Saif-Alyousfi [5] found that, in 47 Asian nations, there was a favorable relationship between the size and businesses profitability. In addition, Neupane [38] indicate that the size and profitability of Nepalese commercial banks were positively correlated in their research. On other hand Vera-Gilces et al. [39] revealed that their research, carried out in a developing nation that has adopted the dollar, showed a negative relationship between size and profitability. Thus, the fourth hypothesis states that:

H_4: Bank profitability in Palestine and Jordan has a relationship with size.

2.5 Liquidity

Isayas [2] revealed that there is a positive correlation between profitability and liquidity in Ethiopian banks, which is in line with the other studies that have investigated the relation between corporate profitability and liquidity. In their Bangladeshi study. Rahman et al. [40] found a favorable correlation between profitability and liquidity. In their Zimbabwean study, Sanderson and Le Roux [41] revealed a favorable relationship between profitability and liquidity. Furthermore, in their study carried out in Malawi, Lipunga and Accounting [42] found a favorable association between profitability and liquidity. However, Almaqtari et al. [43] found that there was a negative correlation between profitability and liquidity in Indian commercial banks. Petria et al. [26] found that there was a negative relationship between profitability and liquidity in the banking systems of the member states of the European Union.

H_5: Bank profitability in Palestine and Jordan has a relationship with liquidity.

2.6 Leverage

Among the myriad of research investigating the connection between corporate profitability and leverage, Isayas (2022) revealed a positive connection between leverage and profitability in Ethiopia [2]. Also Saber Said Al-Delawi and Change [44] discovered a positive connection between leverage and profitability among Iraqi Private Commercial Banks in their research. On other hand Farooq et al. [45] identified a negative connection between leverage and profitability in Pakistan. Alarussi and Gao [23] reported a negative connection between leverage and profitability in China. Nguyen and Nguyen [46] documented a negative connection between leverage and profitability using data from Vietnam. The sixth hypothesis is:

H_6: Bank profitability in Palestine and Jordan has a relationship with leverage.

2.7 External Factors

The inflation and gross domestic product (GDP) are two examples of external variables that impact bank profitability [2].

Gross domestic product

Isayas [2] revealed a positive association between GDP and profitability in Ethiopia. Furthermore, in their cross-country research, Le and Ngo [47] revealed a positive relationship between GDP and profitability. From 47 Asian nations. Saif-Alyousfi [5] discovered a positive relationship between GDP and profitability. A positive connection between GDP and bank profitability was also discovered by Athari [1]. The following is the seventh hypothesis:

H_7: Bank profitability in Palestine and Jordan has a relationship with gross domestic product.

Inflation

Athari [1] discovered a positive connection between inflation and bank profitability in Ukraine, which is consistent with the other research investigating the connection between business profitability and inflation. Furthermore, Saif-Alyousfi [5] discovered a positive connection between 47 Asian nations' inflation and profitability. However, in their cross-country research, Le and Ngo [47] found a negative connection between inflation and profitability. Furthermore, Isayas [2] discovered a negative connection between Ethiopian profitability and inflation. The last supposition is:

H_8: Bank profitability in Palestine and Jordan has a relationship with inflation.

3 Research Methodology

The collection of data, sampling strategy, research model, measurement of variable, and analysis are the main topics of this section.

3.1 Data

Data is gathered from banks' annual reports, which include an income statement and statement of financial situation, and are available on the websites of the Jordan Stock Exchange and the Palestine Stock Exchange between 2011 and 2021. Based on the data that was available, twenty-two banks were considered appropriate for the research. A balanced panel data set with 234 observations makes up the final data set.

3.2 Measurement of Variables

This paper components were measured using previous literature as a guide. The independent and dependent variables are shown in Table 1.

Table 1 Measurement of variables

Type of variable	Variables	Variable Measurement
Dependent	Profitability measured by (ROA)	Net income divided by total assets
	Profitability measured by (ROE)	Net income divided by total equity
Independent variables	Non-debt tax shield (NDTS)	Annual depreciation expense divided by total assets
	Tangibility (TAN)	Fixed tangible assets divided by total assets
	Capital adequacy (CA)	Total equity divided by total asset
	Size	Total asset natural log
	Liquidity (LIQ)	Current assets divided by Current liabilities
	Leverage (LEV)	Total debt divided by total assets
	Gross domestic product (GDP)	Growth of the economy for a country. World Bank indicators
	Inflation (INF)	Annual change in the consumer price index. World Bank indicators
	Country dummy (CD)	1 if the company located in Jordan, 0 otherwise

The research's hypotheses are examined by the estimate of the subsequent linear model.

$$\begin{aligned} profitability = {} & B_0 + B_1 NDTS + B_3 TAN + B_4 CA + B_5 size \\ & + B_6 LIQ + B_7 LEV + B_8 GDP + B_9 iINF \\ & + B_{10} CD + \in \end{aligned} \tag{1}$$

where

e: error term
NDTS: Non-Debt tax shield
TAN: Tangibility
CA: Capital adequacy
Size: size of banks
LIQ: Liquidity
LEV: leverage
GDP: Gross domestic product
INF: Inflation rate
CD: Country dummy.

In this study, we employed a conventional ordinary least square framework (OLS) to estimate the results using random effect or fixed effect based on the Hausman Test results.

4 Finding

This section contains the study's conclusions. The findings of correlation analysis and descriptive statistics are first shown, and then the topic of model estimation is covered.

4.1 Correlation Analysis

Table 2 displays correlation coefficients that shed light on the relationships between several sets of data. According to the table, Return on Assets (ROA) exhibits a positive correlation with Capital Adequacy, Liquidity, GDP, and Inflation, while displaying a negative correlation with Non-Debt Tax Shield, Tangible Assets, Size, and Leverage. Moreover, the relationships among the independent variables generally demonstrate low magnitudes, suggesting the absence of multicollinearity issues in subsequent regression analyses.

Table 2 Pairwise correlations

	ROA	ROE	NDT	TAN	CA	SIZE	LIQ	LEV	GDP	INF	COUNT
ROA	1										
ROE	0.526	1									
NDT	− 0.104	− 0.286	1								
TAN	− 0.193	− 0.310	0.962	1							
CA	0.034	− 0.574	0.523	0.505	1						
SIZE	− 0.028	0.314	− 0.730	− 0.727	− 0.500	1					
LIQ	0.430	− 0.214	0.569	0.444	0.639	− 0.602	1				
LEV	− 0.053	0.569	− 0.344	− 0.345	− 0.873	0.399	− 0.474	1			
GDP	0.115	0.174	0.039	0.099	0.029	− 0.144	− 0.067	− 0.071	1		
INF	0.032	0.092	− 0.082	− 0.076	− 0.026	0.058	− 0.117	− 0.079	0.428	1	
COUNT	0.043	0.064	− 0.345	− 0.422	− 0.144	0.531	− 0.238	− 0.026	− 0.098	0.289	1

4.2 Descriptive Statistics

For the return on assets (ROA) and return on equity (ROE) which are dependent variables, Table 3 presents descriptive statistical measures such as standard deviation, mean, maximum, median, and minimum. It also includes several independent variables, such as non-debt tax shield, tangibility, capital adequacy, bank size, liquidity, leverage, GDP growth, and inflation.

The ROA range for commercial banks in Palestine and Jordan is − 0.074 to 0.082 at the highest, while the ROE runs from − 0.085 to 0.082 at the minimum during the observed period. The mean ROE is 6.8%, whereas the mean ROA is 1%. Furthermore, the average leverage is around 5.681 and the average capital adequacy is 25.3%. These descriptive data shed important light on the financial makeup and operations of the commercial banks that are the subject of the investigation.

Table 3 Descriptive Statistical variables of the study

	Mean	Median	Maximum	Minimum	Std. Dev	Observations
ROA	0.010	0.011	0.082	− 0.074	0.011	234
ROE	0.068	0.077	0.164	− 0.085	0.047	234
NDT	0.003	0.002	0.032	0.001	0.004	234
TAN	0.057	0.023	0.962	0.005	0.127	234
CA	0.253	0.141	0.910	0.075	0.252	234
SIZE	21.092	21.295	24.042	16.246	1.439	234
LIQ	2.329	1.188	33.754	0.671	3.887	234
LEV	5.681	6.073	12.401	0.099	3.143	234
GDP	0.054	0.047	0.166	− 0.093	0.049	234
INF	0.019	0.016	0.048	− 0.009	0.019	234
COUNT	0.658	1	1	0	0.475	234

4.3 Estimation Results

Table 4 shows regression results from different model of the study, with four variants outlined. Models 1 and 3 employed Panel Least Squares, while Models 2 and 4 utilized Cross-section random effects.

The R-squared values indicate that the models account for approximately 27.4 to 48.9% of the total variability in both Return on Assets (ROA) and Return on Equity (ROE). These findings suggest that the selected independent variables collectively contribute to explaining a substantial portion of the variation observed in the dependent variables across the Palestinian and Jordanian commercial banks studied.

The observed positive relationship between bank size and Return on Equity (ROE) align with prior research findings by Derbali [36] and Koroleva et al. [37]. These scholars attribute this relationship to factors influencing profitability within the banking sector. Similarly, the negative relationship between Capital Adequacy and profitability resonates with the findings of Lanka [33] and Serwadda [34], who offer explanations rooted in profitability determinants.

Furthermore, the negative and significant relationship between leverage and ROE echoes the conclusions drawn by Khan [45] and Alarussi [23]. Conversely, the lack of significance for Non-Debt Tax Shield, Tangibility, and inflation in their negative impact on profitability relationship with the findings of Yadav et al. [31] and Le [47].

Moreover, the positive and significant relationship between liquidity, Gross Domestic Product (GDP), and profitability are in line with the research outcomes of Isayas [2], Abdeljawad and Bahlaq [48] and Rahman et al. [40], highlighting the consistent influence of these factors on enhancing profitability within the banking industry. Use random effect for model 2 and model 4 because prop is Correlated Random Effects—Hausman Test 1.000 as presented in Table 5.

Table 4 Estimation results

Model	(ROA) model 1	(ROA) model 2	(ROE) model 3	(ROE) model 4
Variable	Coefficient	Coefficient	Coefficient	Coefficient
NDT	− 0.669	− 1.080	1.107	− 1.549
	(0.643)	(− 0.945)	(0.400)	(− 0.497)
TAN	− 0.009	− 0.002	− 0.033	0.023
	(0.021)	(− 0.045)	(− 0.368)	(0.270)
CA	− 0.022***	− 0.017**	− 0.094***	− 0.084
	(0.006)	(− 2.130)	(− 3.879)	(− 1.676)
SIZE	0.001	0.001	0.008***	0.007
	(0.001)	(0.874)	(2.773)	(0.851)
LIQ	0.003***	0.003***	0.004***	0.004***
	(0.000)	(3.699)	(3.965)	(3.048)
LEV	− 0.001*	0.000	0.003**	0.003
	(0.000)	(− 0.814)	(1.905)	(0.917)
GDP	0.051***	0.050***	0.242***	0.223**
	(0.013)	(2.752)	(4.447)	(2.479)
INF	− 0.016	− 0.015	0.067	0.054
	(0.034)	(− 0.520)	(0.460)	(0.387)
COUNT	0.000	0.001	− 0.004	0.003
	(0.002)	(0.604)	(− 0.537)	(0.185)
C	− 0.007	− 0.004	− 0.125**	− 0.102
	(0.014)	(− 0.253)	(− 2.023)	(− 0.579)
Observations	234.000	234.000	234.000	234.000
R-squared	0.468	0.489	0.462	0.274
Adjusted R-squared	0.447	0.469	0.440	0.245
Durbin-Watson stat	1.654	1.813	0.660	1.003
F-statistic	21.903	23.822	21.346	9.417
Prob (F-statistic)	0	0	0	0
Cross-section random effects	No	Yes	No	Yes

ROA is the dependent variable. Robust standard errors in parentheses
*** p < 0.01, ** p < 0.05, * p < 0.1

Table 5 The Hausman Test for model 2 and model 4

Correlated random effects—Hausman Test (model 2 & 4)			
Equation: untitled			
Test cross-section random effects			
Test summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob
Cross-section random	0	8	1.000

Table 6 illustrates the relationships between various factors and profitability for both Palestine and Jordan separately. In Palestine, a negative and significant relationship exists between Non-Deferred Taxes (NDTs) and asset tangibility with the return on assets (ROA). Conversely, firm size, liquidity, and GDP exhibit a positive and significant relationship with both ROA and return on equity (ROE).

In Jordan, leverage and current assets (CA) demonstrate a negative and significant relationship with both ROA and ROE. On the other hand, GDP shows a positive and significant relationship with overall profitability.

5 Conclusions

This study delved into the determinants shaping the profitability decisions of commercial banks in Palestine and Jordan. It found that factors such as Tangibility, Capital Adequacy, Leverage, Non-Debt Tax Shield, and inflation exhibit an inverse relationship with profitability among Palestinian and Jordanian commercial banks. Conversely, the size of banks, Liquidity, and Gross Domestic Product (GDP) demonstrate a positive relationship with profitability.

Moreover, the findings underscore the significance of information asymmetry as the primary driver influencing financing decisions within commercial banks. The study suggests that firm boards and policymakers should prioritize efforts to enhance information dissemination and foster trust in disclosed information to mitigate the impact of this asymmetry on profitability outcomes.

It is essential to recognize the limitations of the study, including its small sample size, which impedes the findings' capacity to be applied outside of Palestine and Jordan. Future research endeavors could address this limitation by broadening the scope of the study to encompass a more diverse range of countries, thereby providing a comprehensive understanding of how various variables impact the profitability of commercial banks on a global scale.

Table 6 The sample split between Palestine and Jordan

	(ROA) model 1 Palestine	(ROA) model 2 Palestine	(ROE) model 3 Palestine	(ROE) model 4 Palestine	(ROA) model 5 Jordan	(ROA) model 6 Jordan	(ROE) model 7 Jordan	(ROE) model 8 Jordan
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
NDT	− 2.000	− 1.796**	− 5.054	− 0.488	0.820	0.472*	6.040	3.081
	(− 1.511)	(− 5.472)	(− 1.203)	(− 0.160)	(1.602)	(0.744)	(1.632)	(0.657)
TAN	0.011	− 0.088**	0.234	− 0.112	− 0.013	− 0.105	− 0.068	− 0.687
	(0.236)	(− 5.906)	(1.559)	(− 0.877)	(− 0.247)	(− 1.434)	(− 0.178)	(− 1.248)
CA	0.015	0.060	− 0.077	0.012	− 0.011	− 0.008	− 0.186***	− 0.108
	(0.731)	(0.868)	(− 1.206)	(0.069)	(− 1.414)	(− 0.732)	(− 3.163)	(− 1.232)
SIZE	− 0.001	0.002	0.023**	0.021	0.000	0.000	0.004	0.005
	(− 0.248)	(0.641)	(2.463)	(1.597)	(0.829)	(0.534)	(1.300)	(0.747)
LIQ	0.002***	0.000	0.007***	0.001	− 0.002*	− 0.001	0.006	0.004
	(3.751)	(0.480)	(3.612)	(0.342)	(− 1.648)	(− 0.652)	(0.769)	(0.387)
LEV	0.001	0.000	0.005	− 0.006	− 0.002***	− 0.001**	− 0.005**	0.002
	(1.107)	(− 0.427)	(1.252)	(− 1.421)	(− 5.187)	(− 2.497)	(− 1.916)	(0.574)
GDP	0.055**	0.044	0.185**	0.181***	0.063***	0.065***	0.503***	0.510***
	(2.332)	(1.402)	(2.485)	(3.414)	(4.150)	(4.693)	(4.553)	(5.225)
INF	− 0.128	− 0.122	0.265	− 0.530	− 0.015	− 0.012	− 0.143	− 0.126
	(− 0.810)	(− 1.091)	(0.529)	(− 1.209)	(− 0.731)	(− 0.673)	(− 0.936)	(− 0.974)
C	0.011	− 0.025	− 0.453**	− 0.306	0.014	0.010	0.000	− 0.038
	(0.195)	(− 0.330)	(− 2.551)	(− 1.176)	(1.250)	(0.571)	(0.003)	(− 0.283)
Observations	80.000	80.000	80.000	80.000	154.000	154.000	154.000	154.000
R-squared	0.562	0.680	0.597	0.831	0.352	0.261	0.456	0.287

(continued)

Table 6 (continued)

	(ROA) model 1 Palestine	(ROA) model 2 Palestine	(ROE) model 3 Palestine	(ROE) model 4 Palestine	(ROA) model 5 Jordan	(ROA) model 6 Jordan	(ROE) model 7 Jordan	(ROE) model 8 Jordan
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Adjusted R-squared	0.512	0.605	0.551	0.791	0.317	0.220	0.426	0.248
Durbin-Watson stat	1.979	2.345	0.933	1.591	0.803	1.018	0.701	0.977
F-statistic	11.373	9.062	13.140	20.989	9.858	6.393	15.207	7.300
Prob (F-statistic)	0	0	0	0	0	0	0	0
Cross-section fixed or random or none effects	None	Fixed	None	Fixed	None	Random	None	Random

ROA and ROE are Dependent variables. Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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Fintech and Financial Inclusion: A Bibliometric Analysis and Insights

Islam Abdeljawad, Bilal Aqel, and Muiz Abu Alia

Abstract This study aims to review the bibliometric and main themes of the publications on FinTech and financial inclusion. Financial inclusion aims to enhance the accessibility, speed, security, and cost-effectiveness of financial services. Financial technology (FinTech) plays a pivotal role by integrating modern technology and innovations into financial services, striving to improve efficiency and competitiveness. The COVID-19 pandemic emphasized the urgency of digital financial inclusion, particularly for underserved populations, necessitating cost-effective digital solutions tailored to marginalized communities. This study utilized a bibliometric analysis for 1206 documents from the Web of Science database spanning 2019 to 2023. The analysis identified primary themes related to financial inclusion elements, the impact of emerging financial technology, and the FinTech-inclusion nexus. Identified gaps in the literature provide avenues for future research and underscore the evolving FinTech landscape's contribution to financial inclusivity. This study enhances understanding among financial institutions and policymakers regarding FinTech's pivotal role in financial inclusion, offering insights for academic research and policy development in this evolving domain.

Keywords FinTech · Financial inclusion · Economic development · Digital finance · Sandbox

1 Introduction

Financial inclusion has emerged as a critical issue in research in the last two decades with a strong interest by financial institutions and central banks. Financial inclusion, defined as individuals and businesses having access to valuable and affordable financial products and services, aims to make financial services, such as credit facilities, payments, and insurance, more accessible, faster, secure, and cost-effective than

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traditional services [1]. Moreover, these services should be delivered in a responsible and sustainable manner [2, 3]. Significant progress has been made towards financial inclusion, as account ownership increased by 50% globally between 2011 and 2021, from 51 to 76% of adults worldwide [4].

Despite advancements, a sizable portion of the global population still has difficulty accessing basic financial services. FinTech aims to address these challenges by lowering costs, increasing efficiency, and raising financial service awareness [5, 6]. Financial technology (FinTech) is important in this landscape because it incorporates modern technology and innovations into various financial service domains such as banking, finance, insurance, investment, and electronic payments [7–9]. FinTech pioneers new applications such as online banking, smart banking, instant money transfers, electronic payments, crowdfunding, and digital currencies to improve and streamline financial operations for both individuals and businesses, making financial services more efficient, secure, and competitive [10].

In the past five years, the COVID-19 pandemic and the proliferation of artificial intelligence in the financial sector have both underscored the critical nature of expanding digital financial inclusion. Due to the rise in online shopping enabled by e-payment capabilities, COVID-19 heighten interest in financial technology. This emphasizes the necessity of deploying affordable digital platforms that offer alternatives to traditional financial services to the underbanked population. It is the responsibility of service providers to meet the needs of all marginalized members of a society by customizing their offerings and ensuring their delivery is sustainable, cost-effective, and dependable.

This research builds on the need to enhance our comprehension of the relationship between financial technology (FinTech) and financial inclusion through an examination of academic works published within the past five years. The primary aims of this research are as follows: to conduct a bibliometric analysis of the scholarly works that have been published concurrently with the emergence of the COVID-19 pandemic; and to identify the primary trends and developments in this body of work. With a specific focus on the challenges and opportunities associated with FinTech's role in financial inclusion, as well as the factors that propel its ability to enhance financial inclusion. This research enhances the comprehension of policymakers and financial institutions regarding the contribution of FinTech to financial inclusion. Moreover, it establishes a foundation for future research in these domains through the identification of possible deficiencies in the existing body of literature.

2 Methodology

This study explores the role of FinTech in enhancing financial inclusion in the context of COVID-19 by conducting a thorough analysis of previous research using a bibliometric approach. In order to carry out this review, the Web of Science (WoS) database was searched for relevant keywords such as "FinTech", "financial technology", and "financial inclusion". We initially incorporated all documents spanning from 2019

to 2023, resulting in a total of 1462 documents. We eliminate studies that are not in the English language and any documents that are of an editorial nature. Additionally, we assess the title and abstract to exclude studies that are not relevant to our research. The final 1206 documents obtained from WoS, as shown in Table 1, served as the foundation for conducting a bibliometric analysis using the Bibliometrix R application. This analysis aimed to identify and examine different aspects pertaining to the publications in the field.

Next, an analysis of the content of chosen articles was carried out to identify the primary themes regarding the elements of financial inclusion, the influence of emerging financial technology, and the connection between FinTech and inclusion. The goal was to acquire a comprehensive understanding of the various aspects of this dynamic interaction. Moreover, the analysis of the literature uncovered deficiencies in the current knowledge base, creating possibilities for future research endeavours and serving as a basis for proposing recommendations in areas and subjects that show promise for academic research.

Table. 1 Main information about the dataset analysed

Description	Results	Description	Results	Description	Results
Main information about data		*Document contents*		*Document types*	
Timespan	2019–2023	Keywords plus (ID)	1602	Article	868
Sources (Journals, Books, etc.)	586	Author's keywords (DE)	3102	Article; book chapter	15
Documents	1206	Authors		Article; early access	110
Annual growth rate %	39.37	Authors	2938	Article; proceedings paper	7
Document average age	2.36	Authors of single-authored docs	131	Book	1
Average citations per doc	10.84			Book review	5
References	51,948	Authors collaboration		Proceedings paper	76
		Single-authored docs	188	Review	114
		Co-authors per doc	3.14	Review; book chapter	1
		International co-authorships	32.75	Review; early access	9

3 Bibliometric Analysis

In accordance with the previously outlined methodology for reviewing selected articles, the main information about the dataset obtained from the Web of Science is presented in Table 1.

The main journals publishing on relevant topics are categorised in Fig. 1. Sustainability published 58 documents, followed by Environmental Science and Pollution, whereas Sage Open is the last in line.

Analysis of the retrieved articles reveals a steady, high growth of about 40% per year in the number of publications during the study period. Moreover, China stands out as a leading country in publications about FinTech for financial inclusion, as indicated in Figs. 2 and 3.

Examining the top ten frequent keywords, Fig. 4 reveals that "financial inclusion" was the most frequent, followed by "mobile money," and "mobile payment" was the last on the list. We see that payment technologies were extensively researched during this period due to the needs emerged. Figure 5 presents the co-occurrence of

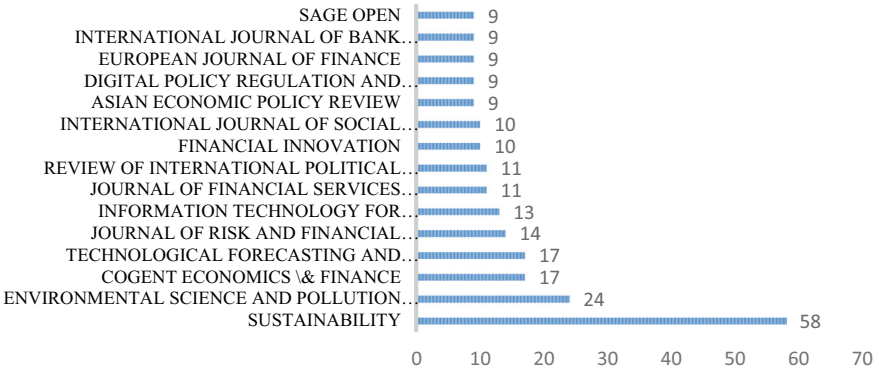


Fig. 1 Main journals publishing on FinTech and financial inclusion

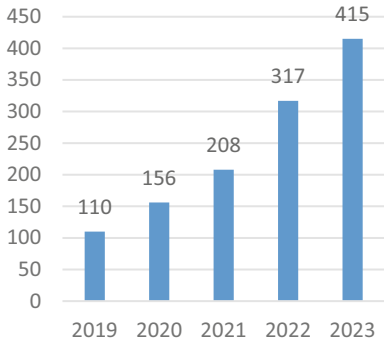


Fig. 2 Articles published per year

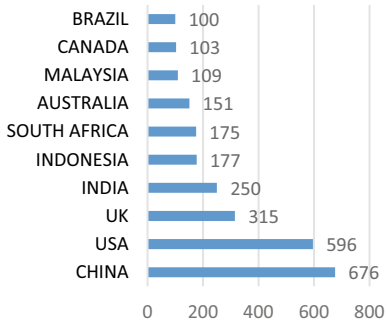


Fig. 3 The top ten countries where articles are published

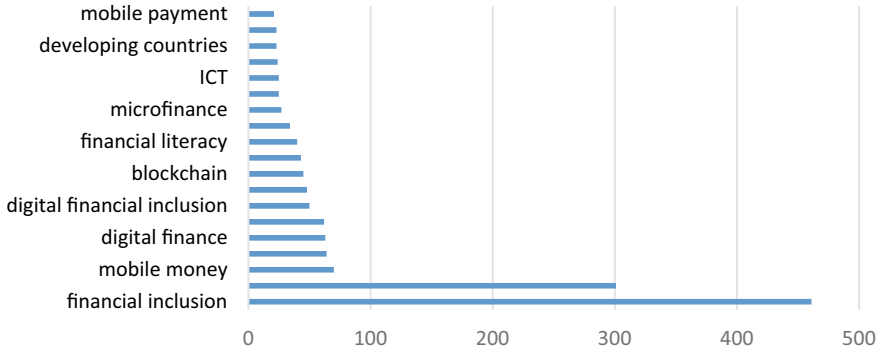


Fig. 4 Occurrences of the top ten keywords

keywords that underscore the multifaceted impact of FinTech. These keywords reveal the interaction of FinTech and financial inclusion with various dimensions, such as COVID-19, poverty reduction, mobile money services, financial development, economic growth, artificial intelligence, the role of microfinance, entrepreneurship, and inequality reduction. The next analysis provides an overview of the diverse subjects covered in the literature, emphasising the intricate relationships between FinTech, financial inclusion, and broader economic development.

4 Main Themes in the Literature

4.1 Financial Inclusion

Recently, financial inclusion has emerged globally as a critical topic attracting attention from financial institutions and central banks [11]. This emergence has been further fuelled by the electronic facilitation of financial transactions using user-friendly methods, primarily through devices like smartphones, with a focus on

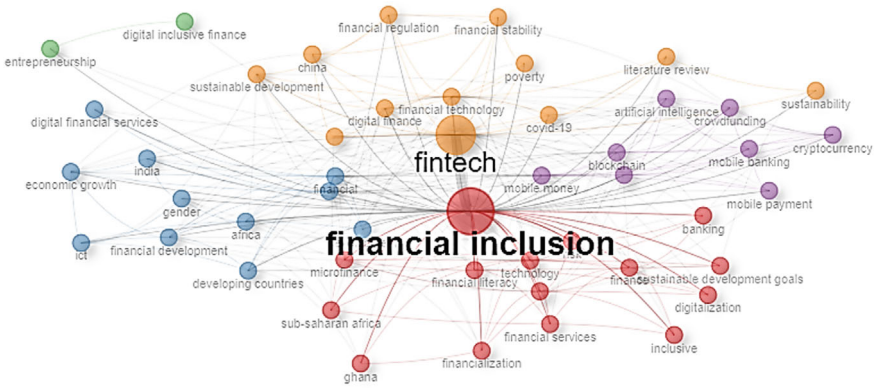


Fig. 5 Co-occurrence of the diverse keywords covered in the literature review

reaching a broad audience at minimal costs. Financial inclusion involves providing opportunities to all segments of society, especially those with lower incomes, to manage their finances and secure their savings through accessible financial services. It extends beyond the mere act of opening a bank account, emphasizing access to financial services [12]. Notable dimensions of financial inclusion encompass cultural and religious products offered by banks and financial institutions, regulatory frameworks, control mechanisms, infrastructure, and technology [13].

The success of financial inclusion strategies depends on a combination of factors, including infrastructure, innovative services, and societal culture. Education levels, perceived security, and trust play pivotal roles in determining the implementation levels of financial inclusion [14]. Financial inclusion is a holistic approach to ensuring that diverse communities can effectively leverage financial services to enhance their economic well-being.

4.2 Financial Technology

FinTech signifies the application of innovation in the financial industry, marking a departure from traditional banking and insurance practices [15]. In regions with fewer bank branches and financial institutions, FinTech serves as an alternative solution, promoting financial inclusion by improving accessibility [16], adoption of digital banking services, and supporting the entrepreneurial ecosystem [17]. FinTech accelerates financial inclusion via the use of socio-credit profiles via social media and customer behaviour [18] and by providing users with easy access to financial services anywhere, anytime [19].

The adoption of FinTech not only transforms financial landscapes but also interlinks with societal dynamics, influencing perceptions, behaviours, and inclusivity. Understanding these interconnections is essential for crafting effective strategies

that leverage technology to enhance financial inclusion. FinTech innovations are reshaping the landscape of financial institutions, particularly in banking, offering novel solutions, promoting financial inclusion, and influencing the future path of the financial sector.

4.3 Fintech and Financial Inclusion in the Era of COVID-19

Reviewing the literature indicates an increasing focus on academic investigations into various facets of FinTech, including innovation, strategic management, and technology adoption [20]. Studies indicate that financial technology plays a pivotal role in promoting financial inclusion, relying on customer intention and behaviour [21]. The rise of FinTech may intensify competition among banks to offer competitive prices for products and services, as the new models of financial services may have a significant impact on traditional bank financing [22]. A study in China suggests that the expansion of digital financial services poses high financial risks from a legal perspective [23].

While financial technology significantly supports financial inclusion, investigating this matter requires careful consideration of social factors, as they are integral to financial inclusions [24]. Amid the COVID-19 pandemic, studies have revealed a growing interest among young people in financial technology, leading to increased online shopping facilitated by e-payment facilities. This shift has resulted in an expansion of financial inclusion during these challenging times [25].

4.4 Financial Inclusion-Fintech Nexus and Economic Growth

The relationship between income inequality and financial inclusion underscores the crucial role played by FinTech in granting access to financial services [26]. Financial institutions leveraging FinTech can facilitate private sector investments and promote and provide opportunities for individuals, especially those with lower incomes, thereby elevating the level of financial inclusion [27]. The widespread adoption of financial technology significantly contributes to expanding the financial inclusion landscape, leading to a remarkable increase in the share of individual income in terms of Gross Domestic Product (GDP) per capita [28]. The impact of financial technology extends beyond individual finances to contribute to overall economic development. A study conducted in China highlights that indicators such as insurance, electronic payments, and credit facilities are linked to economic development as a result of the application of financial technology [21], these factors are instrumental in determining the trajectory of financial inclusion [29].

Governments are playing a vital role in fostering digital transformation and implementing regulations conducive to economic development [30]. Governments, in collaboration with financial institutions, may foster a digital economy by investing in infrastructure and digital identity solutions. These initiatives facilitate the transformation process, ultimately contributing to both economic development and sustainability [30]. As financial technology evolves, it can serve as a catalyst for sustainable practices and inclusive financial services, FinTech emerges as a key driver of economic growth, bridging gaps in financial inclusion, fostering private sector collaborations, and contributing to overall economic development.

4.5 Social Aspects of Financial Inclusion-FinTech Nexus

In regions with prevalent internet and ICT availability, rural areas now can access financial services, especially with the decreasing number of physical bank branches due to digital banking transformation [31]. The rapid revolution in financial technology, coupled with the widespread use of smartphones by 67% of the world's population, signifies that financial inclusion can now encompass individuals in all areas, fostering awareness among all end-users [7]. As FinTech continues to evolve, it presents an unparalleled opportunity to bridge gaps and promote inclusive financial services globally. However, the knowledge and accessibility of technology are deemed important for increasing finance in rural communities [5].

Income inequality, which is one of the socio-economic factors that will promote expansion of inclusion, is a force that FinTech will reduce the differences in the distribution of income [32]. Gender, as an important social factor, largely determines the extent of financial inclusion and access to financial services in the course of digital banking. Women, being central to the materiality of financial inclusion, are more involved in FinTech financial transactions [33]. The positive correlation between female employment and financial inclusion highlights the pivotal role of women's employment in enhancing the overall degree of financial inclusion [34].

The utilization of e-banking establishes a positive and significant relationship with entrepreneurs and start-up businesses. This opens avenues to assess credit positions, but it may also have social implications, potentially affecting employment in banks, particularly in credit and finance facility departments [35]. Entrepreneurs engaging with financial technology play a crucial role in enhancing financial inclusion [36]. The utilization of e-banking contributes to increased financial inclusion, emphasizing the importance of perceived trust in financial transactions [37]. Advanced internet banking specifically designed for segments with inadequate income or low-level payment capacities further improves financial inclusion [38]. Moreover, Information and communication technology (ICT) significantly influence the development of the insurance industry, particularly in the life insurance sector for individuals [39].

In summary, FinTech emerges as a catalyst for improving financial inclusion across various sectors, ranging from microfinance and entrepreneurship to banking

applications and insurance. The positive trends observed underscore the transformative potential of financial technology in expanding access to financial services for diverse segments of society. Future research endeavours should focus on understanding how business strategy, digital services, and microfinance collectively drive financial inclusion [40].

4.6 Enabling Ethical, Sustainable and Green Finance

Financial technology plays a significant role in facilitating efficient green finance, particularly in the context of energy. Green finance and sustainability initiatives contribute to investments in renewable energy [41]. However, the impact of this role on financial inclusion is less pronounced, especially in developing countries [42].

In the realm of Islamic finance, interaction with advisory systems facilitates decision-making, fostering innovative financial solutions that comply with shariah laws and standards. Technology plays a pivotal role in offering these solutions to the Islamic finance sector [43]. Despite concerns that digital transformation might initially reduce bank profitability, the gradual expansion of digital services is expected to increase performance, thereby expanding the customer base and ultimately boosting financial inclusion rates in the long term [44]. The competition between Islamic finance and traditional conventional finance in terms of payment settlement, fees, and advancement necessitates the utilization of financial technology [45].

4.7 Fintech Regulation

Governance in FinTech fosters trust in digital banking services, even for customers who were previously underserved. This stresses the fundamental objective of financial inclusion [46]. A systematic literature review conducted by Afjal spanning selected studies from 2016 to 2023 recommends regulatory bodies focus on the challenges and opportunities posed by digital transformation [47]. The factors influencing financial inclusion across countries include education, customer intentions to use electronic payments, regulatory supervision, and economic development [48]. To foster innovation and financial technology, central banks or regulatory authorities are urged to promote and establish legal procedures. This involves the implementation of special regulatory frameworks such as sandboxes and innovation centers [49]. Consequently, there has been a notable increase in government initiatives aimed to fostering collaboration through programs such as regulatory sandboxes and business incubators [50].

In conclusion, FinTech regulation plays a pivotal role in shaping the readiness of financial institutions for the ongoing FinTech revolution. Recommendations

highlight the importance of addressing digital transformation challenges, implementing suitable regulations, and actively fostering innovation through collaborative initiatives.

4.8 International Perspective on Fintech and Financial Inclusion

FinTech offers significant opportunities for achieving high levels of financial inclusion in different countries. A study indicates that Vietnam, Laos, and Colombia have substantial potential for developing financial inclusion through FinTech initiatives [51]. In Vietnam, households are increasingly utilizing saving accounts and automated teller machines, contingent on the availability of financial inclusion services [52]. In India, research emphasizes the foundational role of Information and Communication Technology (ICT) in promoting financial inclusion. Granting access to financial services is identified as the initial step crucial for achieving comprehensive financial inclusion [53]. Awareness and knowledge of financial services significantly contribute to financial inclusion in India, playing a role in sustainable economic development [24]. In China, another study elucidates that the implementation of financial technology leads to a rise in household consumption, contributing to a reduction in income inequality—an essential objective of financial inclusion [54].

Studies conducted in Arab countries highlight the transformative impact of open trading and financial technology. These innovations bring previously unbanked customers into the financial fold, positively influencing financial inclusion [10]. These international assessments underscore the varied ways in which FinTech contributes to financial inclusion across different regions, paving the road for positive socioeconomic impact globally.

4.9 Recent Trends in Financial Technology and Financial Inclusion

FinTech represents a transformative force within the digital economy, representing new ideas, like artificial intelligence, data analysis, cryptocurrencies, and blockchain technology [11] that are reshaping the financial sector. Technological advancements in artificial intelligence (AI), Internet of Things (IoT), and blockchain technology are deeply influencing digital financial inclusion efforts, particularly in areas concerning risk detection and mitigation [55]. These technologies are instrumental in addressing issues related to information asymmetry, particularly within sectors such as microfinance, insurance, and cash transfers [56].

Consumer-centric innovations such as mobile payments, digital wallets, and direct insurance coverage are facilitating new models of deposits and lending, exemplified

by Peer-to-Peer (P2P) lending and crowdfunding platforms, these platforms are open avenue for decentralized finance (DeFi), offering individuals greater independence and opportunities for participation in the financial ecosystem [16].

4.10 Challenges and Opportunities

Despite the evolution of financial technology, significant challenges remain in the context of financial inclusion. Key among these challenges are concerns regarding job displacement, user acceptance, privacy breaches, and the complexities associated with adoption and implementation [25]. Additionally, the introduction of new business models may create dilemmas in aligning business strategies while protecting the human touch in financial interactions. Moreover, ensuring consumer protection remains dominant in fostering a society with significant well-being [37].

Addressing these challenges necessitates collaborative efforts among stakeholders to advance both fintech innovation and financial inclusion objectives. Exploring potential partnership models between fintech firms, traditional financial institutions, and governments [57, 58]. By fostering collaboration, the stakeholders can work together to develop solutions that promote inclusive access to financial services while safeguarding consumer interests.

5 Conclusion

In this study, we aimed to do a bibliometric analysis of publications related to the role of FinTech in promoting financial inclusion and identify the main themes within these publications. FinTech's positive impact on financial inclusion is highlighted through cost reduction, expanded access to financial services in rural and remote areas, and increased efficiency in offering competitive and high-quality products by financial institutions. FinTech plays a crucial role in promoting financial inclusion and contributing to overall economic development.

FinTech's reach extends beyond traditional banks to include insurance companies, e-wallet providers, and emerging models like open finance, crowdfunding, and microfinance companies. We also recognized the challenges in implementing FinTech, emphasizing the need for organized technology frameworks to ensure consumer rights protection. Achieving digital enablement, facilitated by internet access, PCs, and smartphones, requires cultural change and awareness.

Our study provided recommendations to enhance financial inclusion via FinTech, urging policymakers and stakeholders to adopt programs that support entrepreneurs and start-ups investing in financial technology, along with providing training and incentives. We advocate for encouraging financial institutions to utilize financial technology, providing government support to FinTech start-ups, developing appropriate legislation, and expanding the scope of national financial inclusion plans. For

future studies, we recommend exploring additional dimensions in assessing the role of FinTech in financial inclusion and evaluating the effectiveness of the regulatory framework.

In conclusion, our study underscores the transformative potential of FinTech in reshaping the landscape of financial inclusion. We urge collaborative efforts from governments, policymakers, and the private sector to realize its full potential and ensure inclusive financial services for all segments of society.

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The Effect of Human Capital Disclosure in Integrated and Sustainable Reports on the Financial Performance of Companies Listed in a Stock Exchange

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Abstract "The purpose of this study" was to (analyze the effect of "HC dis-closure" in integrated and sustainable reports on the financial performance of companies). The study examined 30 joint stock companies listed on the Palestine Stock Exchange from 2018 to 2022 using SPSS and Excel. The findings revealed that improved disclosure of HC information significantly reduces a firm's cost of capital and enhances its firm value. With a WACC of 6.9% and TQ at 75.09%, the results indicate efficient financing management. However, the results indicated that the disclosure more information about HC has a significant and weak effect on a firm's "cost of capital". This implies that improving HCDL can lower the perceived investment risk in a company among investors, leading to a lower cost of capital and thus there is a noticeable positive effect on company value due to increased levels of high-risk disclosure. This suggests that better HC disclosure is associated with improved access to external financial resources, thus enhancing firm value. Based on the results, the researchers recommend improving the quality of HC disclosure, which leads to reducing the "cost of capital" and increasing value of the company. It is recommended to improve the quality and transparency of this type of disclosure and enhance the competitive environment.

Keywords Human capital · Integrated reporting · Sustainable reporting · Human capital disclosure · Firm performance · Firm value · Cost of capital

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1 Introduction

The possession of information and the emergence of knowledge economies highlight the significance of intangible assets in generating wealth and achieving critical success factors [1, 2]. As the business environment transitions from the industrial age to the information age, knowledge and effective communication with customers become increasingly important. HC, which encompasses the organization's (knowledge volume, technical skills, creativity, and experience), is now recognized as a valuable asset rather than a costly one [3]. To stay competitive and meet financial goals, companies must capitalize on the expertise and abilities of their employees [4, 5]. Therefore, strategic management and protection of intangible assets are indispensable for organizations to maintain their market position and excel in the competitive business landscape [6].

HC is recognized as a crucial component of intellectual capital [7, 8], comprising the knowledge, skills, creativity, and experiences of a company's employees, which significantly contributes to its economic value [9]. It is viewed as a key resource that can foster "a sustainable competitive advantage" and influence a company's success [10]. The uniqueness and rarity of a company's HC distinguish it from competitors [11]. Increasing emphasis on HC underscores the importance of employee engagement and loyalty for a company's competitiveness and financial performance [12–14]. However, traditional financial reporting's failure to account for intangible assets like human resources has led to a push for voluntary disclosure [15, 16]. This movement seeks to offer "a more comprehensive view of a company's value" and performance by including information on its intangible assets, thereby providing investors, analysts, stakeholders with a clearer understanding of its strategic value drivers and business model [17, 18].

Integrated Reporting (IR) and sustainability reporting have emerged as means to fulfill stakeholders' needs for social and environmental information [19], incorporating both financial and non-financial aspects to highlight future value creation [20, 21]. These reports, encouraged by the International Integrated Reporting Council (IIRC), cover a range of capitals including financial, manufacturing, intellectual, human, social, and natural [22]. The practice, adopted across both public and private sectors [23], aims to showcase how investments in HC contribute to a company's performance and financial value, enhancing its appeal to investors and shareholders interested in the human elements driving success [24].

This research investigates the effect of HC disclosure on a (company's value and financial performance), emphasizing its importance in sustainable and integrated reporting. It explores how disclosing HC information can enhance a company's competitiveness, profitability, and attractiveness to investors by demonstrating the strategic management and investment in HC [25, 26]. The study aims to provide insights on the financial benefits of HC disclosure, advocating for practices that improve transparency, stakeholder understanding, and trust, while also addressing the challenges of balancing confidentiality. It underscores the role of HC in achieving sustainable development and enhancing corporate financial value [27]. This research

contributes to directing future research and practices in the field of HC disclosure and its role in achieving sustainability and financial success of companies.

2 Theoretical Aspect, Previous Studies and Developing Hypotheses

The study [11] on the National Insurance Corporation of Eritrea, involving all 73 employees at the company's headquarters, identified challenges in implementing Strategic Human Resource Management (SHRM) practices due to the lack of a formal strategic plan and a shortage of qualified staff, alongside a need for better employee motivation strategies. The study [28], which surveyed 397 employees across various departments in eight Nigerian banks, revealed that HRM practices, especially in reward and employee performance management, significantly influence (the non-financial performance of banks, while employee resourcing had minimal impact. It suggests banks should enhance their reward and performance management strategies to improve non-financial performance).

The study [29] highlighted the critical role of human resources in giving companies a unique competitive advantage in Mogadishu-Somalia, focusing on the "effects of recruitment, selection, and compensation on organizational performance", and found a positive influence of organizational performance on HC. Study [30] examined the influence of HC on the return on equity (ROE) of commercial banks in Jordan using the VAIC model from 2010–2015, revealing HC as a major component of IC but found no significant impact on ROE, suggesting banks to prioritize HC. Study [31] explored the concept of "human capital" in integrated and sustainability reports, proposing a theoretical model for its presentation and developing specific public disclosure indicators, emphasizing the importance of HC in corporate reporting.

The study [32] explores how disclosing intellectual capital (IC) quality affects firm value, based on 110 companies. It reveals a positive link between IC components (structural, human, social/relationship) and firm value, emphasizing the significance of IC disclosure for entities, investors, regulators, and managers in firm evaluations. Meanwhile, study [33] investigated the adoption of Integrated Reporting (IR) in Malaysia, following the MCCG 2017 guidelines, to enhance corporate governance and investor relations. It proposed a framework to explore the role of sustainability reporting in improving IR adoption, aiming to reduce information asymmetry and enhance transparency and value creation among the largest Malaysian public companies.

The study [34] demonstrated that disclosing human capital (HC) information in integrated reports significantly lowers a company's cost of capital and enhances its value, based on an analysis of 375 observations from 125 firms between 2017 and 2019. This suggests that better HC disclosure can mitigate investor risks and improve financial resource access. Study [35] found a significant positive relationship between human capital investment and the sustainable performance of institutions

in M'sila, Algeria, highlighting HC's importance in ensuring institutional success and sustainability, based on feedback from 110 administrative workers across twelve institutions.

Human capital (HC)

The human element "is one of the most important components of intellectual capital (IC)", highlighting the economic value of employees' collective knowledge, skills, and experiences, traces its roots back to Adam Smith's 1776 work, The Wealth of Nations. The term gained prominence in the 1960s with American economists demonstrating HC's direct contribution to income growth [36]. HC is essential for an organization's competitiveness and economic value [37], marked by education, experience, and skills that enhance performance and competitive market advantage [38]. HC is also seen as a strategic, difficult-to-imitate resource, highlighting its importance in leveraging economic resources and driving success [39, 40]. Investing in HC through skill and knowledge development leads to increased productivity, better adaptation to economic and technological changes, and higher profits [41, 42]. Incorporating HC information into sustainability reports, using both financial and non-financial indicators, offers insights into its impact on organizational sustainability and growth, underlining HC's role in economic and social development [43].

Therefore, Sustainable performance indicators can improve a company's financial performance by making it more appealing to investors and customers, reducing risks, and enhancing sustainable returns [44]. The relationship between HC and financial performance is crucial, as it boosts employee commitment, productivity, reduces costs, and increases revenues, leading to better financial outcomes. Integrating financial with sustainable performance grants companies a competitive edge. Transparency in sustainability reporting, especially regarding human capital, can attract sustainability-focused investors and customers, contributing to a company's long-term success and sustainability goals [45].

In summary, the research emphasizes the importance of integrating HC and financial performance data into sustainable reports to enhance transparency and support social, environmental, and financial objectives. HC, highlighting the collective skills, knowledge, and abilities of individuals, "plays a crucial role in economic development and organizational success". The study aims to explore how effectively disclosing HC information can boost investor confidence, increase company valuations, and ultimately improve financial performance, underscoring HC growing significance in achieving sustainability and future growth.

Study problem

However, the main problem is accurately measuring the financial consequences of such disclosure. If these consequences are not carefully evaluated, they may result in additional costs for companies, including costs for developing human capital management systems and training employees. It is also important for companies to understand the impact of such disclosure on the stock market and their relationship with investors, as inappropriate disclosure may reduce confidence and investment.

Therefore, companies must carefully consider the balance between the potential benefits and financial costs of exposing HC [41].

Accordingly, the problem of the study can be formulated through the following main question: "What is the effect of disclosing HC in integrated and sustainable reporting on the financial performance of companies Listed in Palestine Stock Exchange?".

Study hypotheses

H0: There is no statistical significance about the effect of disclosing HC in integrated and sustainable reports on the financial performance of "companies Listed in Palestine Stock Exchange" at the significance level (0.05).
H1: There is no effect between WACC and HCDL at the significance level (0.05).
H2: There is effect between TQ and HCDL at a significance level (0.05).

3 Methodology

Study population and sample

The study population includes (joint-stock) companies listed on the Palestine Stock Exchange. The study sample was 30 companies selected. Financial companies represented in different sectors were excluded, noting that the study will take place over a period of five years (2018–2022). However, Table 1 shows that 5 companies were taken from (the insurance sector and 4 from the banking sector, 6 from the services sector, 8 from the industrial sector, and 7 from the investment sector).

Measuring variables

First: Independent variables:

In this study, the "independent variable" is identified as the level of disclosure of human capital (HCDL), which is quantified using a manual content analysis approach. Krippendorff [46] content analysis is defined as a methodological approach utilized in research for drawing valid and reliable conclusions from data, taking into account the context of the data.

Thus, identifying elements that represent more specific and precise elements, that is, if the level of disclosure about HC that the joint stock companies disclose within the integrated reports is measured. The identified elements were sorted and analyzed, resulting in the removal of certain items and the consolidation of others

Table 1 Selected sample

Total	Investment sector	Industry sector	Insurance sector	Services sector	Banking sector	Year
30	7	8	5	6	4	2022–2018

to prevent duplication. This evaluation was conducted using a binary system, minimizing subjectivity in the assessment of our "independent variable" and facilitating comparison with other studies on HC detection for each element [46Scores are assigned a value of 1 if an element is present and 0 if it is absent [47, 48]. Consequently, HCDL scores may vary from 0 to 30, as illustrated in Table 2, As shown in Table 2, the survey list was developed from a study referenced as [34]. The researchers adapted it to better fit the Palestinian context. They selected 30 companies to observe over a period of 5 years, indicating that there should be a total of 150 observations.

Second: Dependent variables:

The study utilized "two (dependent variables): the Cost of Capital (WACC) and the TOPIK (TQ)", which represents that the (cost of capital) is a measure used to calculate the average "cost of capital" for a company, and it includes both the cost of debt and the cost of equity. WACC is commonly "applied as the discount rate for assessing the viability of future investments or projects". It is a way to measure the cost a company incurs to finance its assets. WACC is calculated as follows (Table 3).

WACC represents the total capital cost for a company, calculated by "averaging the costs of debt and equity capital", weighted according to the proportions used in previous research methodologies [49].

(Tobin's Q) is a gauge used in financial analysis to evaluate companies. It was developed by James Tobin, Nobel Prize winner in economics. This measure compares a company's total market value to the total book value of its assets. This measure was introduced [13] as an indicator of a company's future investment activities. The TQ law calculates the ratio of the total market value to the total book value of physical assets [13].

Third: Control variables:

See Table 4.

Statistical analysis

In order to reach the results of the study and test the validity of the hypotheses, the statistical package program Spss and Excel was used, by analyzing the data available in the "financial statements of stock companies listed in the Palestine Stock Exchange".

- Descriptive analysis of study variables

Table 5 shows "the arithmetic means and standard deviations for the study variables". The dependent variables are the WACC of 6.9% and the TQ of 75.09%. These results are consistent with previous studies [52, 54–56]. As for the independent variable HCDL, the average value is 11.3, and the minimum ranges from 7 to the maximum of 15. As for the (control variables), the "average values" for LNTA are 16.78, MTA is 1.18, DA is 11.3%, SG is 13.81%, and ROA is 3.97%. Thus, the WACC indicates that the company is obtaining financing at a relatively low cost, which reflects efficiency in managing its financing structure. On the other hand, a TQ of 75.09% indicates that the market values the company as being worth less than

Table 2 HC

S. no.	HC items	Repetitions	Percentage
1	Employee headcount	130	86
2	Termination count	40	26.67
3	New hires	45	30
4	Staffing shortages	55	36.67
5	Internal staff mobility	20	13.33
6	External staff mobility	50	33.33
7	Age distribution of employees	60	40
8	Employee seniority levels	70	46.67
9	Employee gender distribution	70	46.67
10	Staff sorted by educational qualifications	70	46.67
11	Employees sorted by job functions	40	26.67
12	Employee distribution across regions	55	36.67
13	Educational workshops	85	65.67
14	Costs of training programs	70	46.67
15	Hiring strategies	60	40
16	Payroll policies	65	43.33
17	Incentive program rules	90	60
18	Health and safety standards	75	50
19	Staff culture and values	20	13.33
20	Staff leadership initiatives	40	26.67
21	Staff perks and advantages	40	26.67
22	Satisfaction levels of staff	70	46.67
23	Staff participation in community initiatives	50	33.33
24	Productivity of employees	25	16.67
25	HC metrics, such as sales and profitability per employee	40	26.67
26	Opportunities for career progression	15	10
27	Joint labor agreements	70	46.67
28	Education for top-level executives	40	26.67
29	Executive management's work experience	20	13.33
30	Entrepreneurial enthusiasm	25	16.67

the replacement value of its assets, which may indicate market conservatism about a company's growth potential or market valuation.

- Correlation analysis

The Pearson correlation coefficient analysis is shown in the Table 6, which shows the correlation matrix between the various independent and dependent variables of the study. As there is a strong positive relationship between TQ and HCDL with a

Table 3 WACC measurement

WACC = (E/V) * re + (D/V) * rd * (1−T) where;	
E	Is the market value of the firm's equity
D	Is the market value of the firm's debt
V	The market value of the company
re	Is the firm's cost of equity capital
rd	Is the firm's cost of (debt capital)
T	Represents the firm's (corporate tax rate)

Table 4 The measurement of control variables

Variable	Symbol	Description	Source
Firm size	LNTA	Natural logarithm of a firm total assets	Al Momani et al. [50], Nour et al. [51]
Leverage	DA	Total debt divided by total assets	Al Momani et al. [52]
Market to book ratio	MTB	Market value of equity at the end of the fiscal year divided by the book value of equity at the fiscal year close	Fama and French [53]
Return On Assets	ROA	Ratio of net income to total assets	The financial statements of joint stock companies listed on the Palestine Stock Exchange were relied upon
Sales growth rate	SG	Change in sales (%) respect to the previous year	The financial statements of joint stock companies listed on the Palestine Stock Exchange were relied upon

Table 5 Descriptive statistics analysis of variables

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
WACC	150	0.00	0.28	0.0697	0.05627
TQ	150	0.00	2.39	0.7509	0.61425
HCDL	150	7.00	15.00	11.3000	2.26069
LNTA	150	0.00	22.60	16.7824	4.65747
DA	150	0.00	0.62	0.1138	0.15037
MTB	150	0.00	5.46	1.1821	0.89541
ROA	150	0.00	0.15	0.0397	0.03858
SG	150	0.00	3.12	0.1381	0.39876
Valid N (listwise)	150				

value of 0.713, while the correlation coefficient between HCDL and WACC with a value of 0.205 is a "weak positive relationship". As for the control variables, the relationship between HCDL and the control variables is very weak, while the relationship between TQ and MTB is strong at 0.662 and the rest of the variables are very weak, while the relationship between WACC and ROA is strong at 0.630 and the rest of the variables are very weak.

Regression analysis and hypothesis testing

To test the "validity of the study hypotheses" and to know the impact of disclosing the level of HC disclosure as part of integrated and sustainable reports, a simple and multiple linear regression model was used, and the results of the regression analysis were as follows:

First hypothesis: There is no effect between WACC and HCDL at the significance level (0.05).

Whereas Tables 7 and 8 shows the effect of a relationship between the WACC and disclosure of the level of HC. The results of the statistical analysis showed that (there is no statistically significant effect between WACC and HCDL), as the correlation coefficient reached 0.205 at the significance level (0.05), that is, there is no effect between WACC and HCDL. The correlation between the two variables is weak.

The adjusted R square was 0.042, meaning that disclosure of the level of HC explains 4.2% of the WACC. The value of the degree of influence (the slope of the regression equation β) was -0.045. This means that the beta value is very small, and

Table 6 Pearson correlation matrix between study variables

Correlations								
SG	ROA	MTB	DA	LNTA	TQ	WACC	HCDL	
							1	HCDL
						1	0.205	WACC
					1	0.213	0.713**	TQ
				1	0.133	0.167	0.164	LNTA
			1	0.049	0.095	− 0.112	0.242	DA
		1	− 0.138	0.054	0.662**	0.172	0.456	MTB
	1	0.192	0.014	0.105	0.379	0.630**	0.342*	ROA
1	− 0.078	− 0.030	− 0.083	0.069	− 0.078	− 0.133	− 0.146*	SG

Table 7 The strength of the connection between WACC and HCDL

Model summary				
Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.205[a]	0.042	0.035	0.05526

[a]Predictors: (Constant), HCDL

Table 8 Regression analysis between WACC and HCDL

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.024	0.021		1.146	0.254
	HCDL	− 0.001	0.002	− 0.045	− 0.589	0.557
	LNTA	0.001	0.001	0.120	1.871	0.063
	DA	− 0.051	0.024	− 0.137	− 2.107	0.037
	MTB	0.005	0.004	0.085	1.203	0.231
	ROA	0.889	0.098	0.610	9.090	0.000
	SG	− 0.015	0.009	− 0.109	− 1.716	0.088

[a]"Dependent Variable": WACC

this influences the reduction of capital costs via disclosure through the level of risk in estimating its impact on investors' preferences and information asymmetry. The value of F reached – 0.589, which is not significant at the significance level (0.05 > a), and this is confirmed by the fact that Sig F equals 0.557, and this "value is greater than the level of significance (0.05 > a)", so it confirms that acceptance of the hypothesis.

The following model measures these variables:

$$\mathrm{H1}: \mathrm{WACC} = \alpha 0 + \alpha 1\,\mathrm{HCDL} + \alpha 2\,\mathrm{LNTA} + \alpha 3\,\mathrm{DA} + \alpha 4\,\mathrm{MTB} + \alpha 5\,\mathrm{ROA} + \varepsilon$$

Second hypothesis: There is effect between TQ and HCDL at a significance level (0.05).

Whereas Tables 9 and 10 shows the effect of (a relationship between Tobin's Q and disclosure of the level of HC). The results of the statistical analysis showed the presence of a statistically significant effect between TQ and HCDL, as the correlation coefficient reached 0.713 at a significance level of (0.05), meaning that the relationship is strong between the two variables.

The "adjusted R square" was 0.509, meaning that disclosure of the level of human capital explains 50.9% of TQ. The value of the degree of influence (the slope of the regression equation β) was 0.495. This means that managers use HC to improve and

Table 9 The strength of the connection between TQ and HCDL

Model summary				
Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.713[a]	0.509	0.506	0.43192

[a]Predictors: (Constant), HCDL

Table 10 Regression analysis between TQ and HCDL

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	1.198	0.177		− 6.770	0.000
	HCDL	0.135	0.016	0.495	8.493	0.000
	LNTA	0.003	0.006	0.019	0.395	0.694
	DA	0.346	0.202	0.085	1.717	0.088
	MTB	0.290	0.037	0.423	7.870	0.000
	ROA	2.047	0.812	0.129	2.521	0.013
	SG	0.013	0.075	0.008	0.170	0.865

[a]Dependent Variable: TQ

enhance the value of the company and thus reduce TQ through non-diversifiable risks to estimate and enhance investors' outlook regarding the company's earnings potential and expansion. F reached a value of 8.493, which is A function at a significance level of (0.05 > a), and this is confirmed by the fact that Sig F equals 0.000, and this value is less than the significance level of (0.05 > a), so it confirms that accepting the hypothesis. These results are consistent with previous studies [55, 57, 58].

The following model measures these variables:

$$H2 : TQ = \alpha 0 + \alpha 1\, HCDL + \alpha 2\, LNTA + \alpha 3\, DA + \alpha 4\, SG + \alpha 5\, ROA + \varepsilon$$

4 Conclusion

This research demonstrates the importance of disclosing HC as part of integrated reports and sustainability reports in improving investors and stakeholders' understanding and appreciation of the role of HC in achieving the success and sustainability of joint stock companies in Palestine. By analyzing the financial and economic consequences of such disclosure, we find that there is an opportunity to enhance transparency and build trust between companies and all stakeholders. Striking the balance between maintaining confidentiality and disclosing sensitive information remains an ongoing challenge. However, "companies can benefit from the guidance of this research to develop better and sustainable disclosure practices that contribute to enhancing the financial value of the company".

The Weighted Average Cost of Capital (WACC) standing at 6.9% suggests that the company is able to obtain financing at a relatively low cost, reflecting an efficient management of its financing structure. Conversely, Tobin's Q ratio at 75.09%

indicates that the market values the company lower than the replacement value of its assets. This discrepancy could signal a conservative market stance towards the company's growth prospects or overall market valuation.

A significant positive correlation has been identified between TQ and HCDL with a coefficient of 0.713, illustrating a strong relationship. However, the correlation between HCDL and WACC is relatively weak, with a coefficient of 0.205, indicating only a slight positive association. Other study variables show no significant relationship, highlighting their weak impact within this context.

The research reveals that increased transparency in human capital information significantly lowers the firm's (cost of capital). This phenomenon suggests that by enhancing HCDL, companies can reduce the perceived risk among investors, leading to a decrease in capital costs.

Furthermore, the study notes "a positive impact on the company's value" associated with higher levels of risk disclosure. This observation suggests that improved disclosure regarding HC correlates thus improving the company's value by facilitating greater access to external financial resources.

The financial advantages of HC disclosure prompt firms to offer more comprehensive details on their HR within integrated reporting. This practice not only lowers the cost of capital but also increases the company's value, supporting the broader adoption of integrated reporting.

These findings underscore the importance of interconnectedness in preparing integrated and sustainable reports. They highlight how such reporting can aid in understanding (the value creation process and improve decision-making among investors).

Finally, the study offers empirical evidence that transparent and comprehensive reporting on HC serves as a mechanism to mitigate investment risks and enhance the company's value. It posits that HC disclosure transcends corporate transparency, carrying significant financial implication.

Based on the findings of the previous study, researchers have made several recommendations to enhance "the financial performance and sustainability" of companies through improved HC disclosure. They suggest that companies should enhance the transparency of their integrated reports by offering detailed and clear information about human capital. This includes insights into training and development, well-being, organizational culture, and other relevant areas.

There is an emphasis on increasing both internal and external training courses for employees at all job levels to develop their knowledge and keep them updated on new developments in their work fields. The recommendations extend to banks, advising them to invest in HC by employing competent and experienced individuals and providing training for current employees. Moreover, it is suggested that financial rewards be given to experienced employees who possess practical and scientific competencies capable of supporting company objectives, thereby enhancing productivity and positively influencing financial performance, which is foundational for sustainable growth and achieving strategic goals. Improving the quality of HC disclosure is identified as crucial since such disclosure can lead to reduced capital costs and increased company value. Companies are encouraged to provide more

detailed and specific data regarding employee development, training, organizational culture, and other HC aspects to improve investors' and stakeholders' understanding. Linking HC information directly "to the company's financial performance is recommended to demonstrate how HC contributes to the company's financial and competitive success". Additionally, companies are urged to underscore the role of HC in governance strategies and its contribution to achieving sustainability and corporate social responsibility goals.

Finally, the use of modern technology for analyzing and presenting HC data is advocated to offer deeper and more accurate insights, facilitating a more comprehensive understanding of HC impact on company performance and value.

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Improving Marketing Mix Elements with Artificial Intelligence: A Comprehensive Review



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Abstract Artificial intelligence (AI) is closely linked to economic and administrative development, as artificial intelligence plays an important role in shaping and transforming various aspects of the national and international economy and administrative and marketing practices at all levels and in all types of business establishments. Integrating AI technologies and methods into marketing methods and systems has the potential to stimulate and drive innovation, enhance productivity and market share, improve decision-making processes, and create new opportunities for growth and sustainable marketing development. The current paper aims to propose a model link between the artificial intelligence tools and the marketing mix elements in order to be used by all types of companies. It also aims to identify the impact of these technologies on reaching the target audience, improving user experience and customer interaction, and measuring their impact on marketing using social media.

Keywords Artificial intelligence · Marketing mix · Big data · Tools

1 Introduction

Today, the world is going through the fourth industrial revolution, also known as the digital transformation phase, It adopts digital technologies in all fields, and artificial intelligence is one of the most important of these in the process of digital transformation, although it was developed several years ago, over the course of those many years it has become one of the most important modern trends in the field of marketing,

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and one of the most important technologies that must be used in order to survive and continue [1]. Its application is not limited to, it applies to companies concerned only with the field of technology, but also with all specializations, without being restricted by size. Artificial Intelligence is on the cusp of a major transformation in the world of marketing, by automating processes, promoting personalized marketing, and significantly changing the way ideas are generated, paving the way for a new era of marketing capabilities [2].

The facility's goal can be considered cheaper, faster, more accurate, and more efficient than the human factor because it has a positive impact on gaining customer satisfaction by providing products that compatible with their needs and desires, and it is also expected that there will be a breakthrough and rapid growth in the customer service sector of 31% until 2026, especially since the time of the pandemic of Corona, with closures and home quarantine, forcing customers to rely on internet tools-especially the artificial intelligence one such as automated conversations to obtain information and make decisions about purchasing products and making choices between brands [3].

As a result of the importance of that role provided by practices artificial intelligence for online store owners and with the continuous increase in the number of people dealing with them, the current paper is interested in showing the importance of improving marketing mix elements with artificial intelligence.

On other hand, there are several potential drawbacks resulting from utilizing AI in digital transformation. Such challenges include lack of authenticity, which is considered as one of the main ethical concerns surrounding AI in marketing is the potential erosion of authenticity. With the advent of AI-generated content, it has become difficult for audiences to distinguish between real and artificial influencers. Blurring the lines can lead to a loss of trust and credibility in the influencer marketing industry. Moreover, deceptive practices is one of the main challenges resulting from AI in digital transformation field, where AI-powered influencer marketing can also lead to deceptive practices, such as deepfakes. Deepfake technology involves using artificial intelligence algorithms to manipulate or manufacture videos or images that appear realistic but are completely artificial. This technology can deceive audiences by creating fake endorsements or testimonials from influencers without their knowledge or consent. Also, loss of human connection is another ethical implication of AI in influencer marketing and advertising is the potential loss of human connection and real interaction. As AI algorithms become more sophisticated, they can mimic human behavior and engagement, making it difficult for audiences to differentiate between AI-generated content and human-generated content. The last challenge is unfair competition, where the use of AI in influencer marketing and advertising can create an unfair competitive landscape, especially for micro-influencers or content creators who do not have access to advanced AI technologies. AI algorithms can create content at a rapid pace, target specific demographics and improve engagement, giving brands an unfair advantage in reaching and influencing audiences. For example, if a brand uses AI-generated influencers to promote its products, it could potentially dominate the market by flooding social media platforms with personalized content. This can make it difficult for human influencers to compete on equal

footing, as their authenticity and creativity may be overshadowed by AI-generated influencers with superior reach and engagement metrics.

2 Literature Review

Big data, AI (Internet of things), and intelligent artificial things have all seen remarkable technical advancement, which has a significant impact on how businesses function [4]. In comparison to more conventional approaches, these technological advancements allowed for the development of cutting-edge digital solutions that gave businesses an edge in the marketplace by attracting and retaining customers. When it comes to AI in particular, it is thought to be the most impactful technology on these businesses [2].

Businesses have found ways to use AI in their marketing campaigns to better understand their customers, make predictions about their actions, and ultimately satisfy their wants and needs [5]. There is a plethora of current uses for artificial intelligence. In contrast to its lethal uses in wars, whether through military robots or drones, there are security and military applications, such as programs that can distinguish and recognize faces [6]. These programs can also deal with electronic attacks and even launch attacks that penetrate opponents' cyber systems. On the other hand, there are medical applications, like those not only can these apps detect and remove cancers, but they are also integrated with social media platforms [7]. These applications have started to make their way into the artificial sector, and they've already accomplished a lot, from mundane office and factory duties to things that humans just can't do.

Humans are capable of doing it, for example, in space or the oceans. An additional area where AI has proven useful is in accurately predicting product demand and supply [8]. More precise sales volume and consumer trend forecasting, as well as the opportunity for greater storage operations management, can be achieved with the use of artificial intelligence approaches. With the right combination of smart robots and efficient logistics, AI can assist marketing professionals in seeing the future [9]. For example, cutting-edge text analysis tools and the technological roadmap for the future of the business additionally, several industries make use of machine learning algorithms to analyze client data and pinpoint the most suitable target audience, including online shopping, finance, and tourism [10]. When compared to humans, artificial intelligence is better able to handle massive amounts of data. Considering every conceivable scenario, the AI system is programmed to keep an eye on its surroundings and respond accordingly. By analyzing a machine's past performance, artificial intelligence may foretell when it might break down, allowing us to plan accordingly [11]. Brainpower differs. When compared to traditional automatic systems, which are able to carry out the same mundane tasks over and over again, artificial intelligence systems are able to learn from their mistakes and adapt to new situations without requiring any further programming [12].

However, there are several challenges and limitations resulting from the adoption of AI in marketing mix including data accuracy and availability, where cost model simulators rely heavily on accurate and reliable data. Ensuring the availability of such data can be a challenge, especially when dealing with complex and dynamic cost structures. Companies need to invest in data collection, integration, and verification processes to overcome this challenge. The second challenge is model complexity, where cost model simulators can be complex, and require a certain level of expertise to run effectively. This complexity may pose a challenge for companies with limited resources or technical knowledge. Investing in training and internal capacity building can help overcome this constraint. Thirdly, assumption sensitivity where cost model simulations depend on certain assumptions and inputs. The results obtained are sensitive to these assumptions, which may change over time or in response to market dynamics. Regularly reviewing and updating assumptions is critical to maintaining the accuracy and appropriateness of simulations. Fourthly, Integration with existing systems, where integrating the cost model simulator with existing systems and software can be difficult. Compatibility issues, data transfer complexities, and the need for IT support may arise. Working closely with IT teams and seeking vendor support can help overcome these integration challenges. Finally, cost and resource Investment were implementing and using a cost model simulator requires an investment in terms of cost, time, and resources. This investment may be a disadvantage for small businesses or those with limited budgets. Conducting a cost-benefit analysis and exploring cost-effective options can help overcome this limitation.

2.1 Artificial Intelligence

The combination of the words "intelligence" and "artificial" yields the term "artificial intelligence," which means the capacity to comprehend novel contexts [13]. Intelligence is evolving and novel, says Webster's. The definition of the word "artificial" is anything that is the product of deliberate and intentional human intervention, whether that is the creation of an object or the execution of an action. Artificial intelligence (AI) is defined as a subfield of computer science [14].

As a field of study, artificial intelligence (AI) relies on creating gadgets and computer programs that can mimic human thought processes, including learning, decision-making, and action-simulation [15]. Hence, AI is the study of how computers can mimic human intelligence. This is achieved by studying human behavior in controlled environments, recording how people react, think, and handle these challenges. The goal then is to develop AI systems that can mimic human intelligence. Intricate computer system. Therefore, AI-defined machines and programs learn, gather data, analyze it, and make decisions based on these analyses in a manner that is like human thought processes [16]. The field known as "artificial intelligence" studies how to program computers to mimic human intelligence. Acting is innate to

the human condition and touches on many different areas, such as handling conversational language, robotics, identifying voice, advanced neural networks, and expert systems [17].

The retail trade, healthcare, education, financial services, manufacturing, and energy sectors are among those that have been significantly impacted using artificial intelligence [18]. By constantly analyzing and learning from both historical and real-time data, machines equipped with AI can, for instance, evolve into self-improving production systems that optimize their own operations [15]. Cites the usage of AI in retail trade as another example, specifically in the areas of electronic customer care and order processing, where the technology helps businesses gather and understand consumer wants and needs [19].

AI was first proposed in the 1940s and eventually reached Artificial intelligence skills that were previously impossible owing to a lack of data are now a reality because of numerous factors, one of which is the availability of vast quantities of big data from a variety of sources. Furthermore, numerous facets of AI have been advanced because of the presence of open-source communities on various social media platforms that create and share AI tools and applications [20]. By developing B computer programs that can mimic intelligent human behavior, the field of artificial intelligence seeks to comprehend the essence of human intelligence. The capacity of a computer program to choose the best course of action to take to resolve an issue or arrive at a conclusion given only a description of the problem or circumstance is what this term refers to. We will likely have to take 80% of the time off in many circumstances when computers can do some repetitive or hard work, according to scientists. This will happen within the next several years. Possible options: The greatest challenge humanity has is formulating moral guidelines for computers. Now, UNESCO is putting an emphasis on a worldwide consensus regarding the ethical aspects of AI in the fields of education, the natural sciences, the social sciences, and the humanities. When it comes to AI, UNESCO follows the guidelines laid out by culture, communication, and information [21]. Under the United Nations' framework for the universality of the Internet and the so-called "Rome Principles," which assert that the four pillars upon which knowledge societies are built—being rights-based, being open, being available and accessible, and being multi-stakeholder—digital transformation and digital governance in general should be governed. The development of artificial intelligence is guided by UNESCO's vision of knowledge societies [22].

2.2 Artificial Intelligence and Marketing Mix

In today's business world, firms across all industries rely on various forms of artificial intelligence. AI is widely recognized by both academics and practitioners. Given the rapid technological advancement that has linked the entire planet into a single network, businesses will be guided by the technologies of the future [23]. However, it should be mentioned that gaining a competitive edge is not just about knowing the

client and what he wants; it's also about making solutions that meet those wants and needs so that the customer is happy and loyal to the business [12].

2.3 Artificial Intelligence in Product Management

Discovering and identifying the most suitable product for the consumer, considering his needs and preferences, is made much easier with the use of market analysis approaches based on artificial intelligence. Providing a product that meets the customer's expectations is the company's success [24]. The marketing team can better understand the consumer's wants and needs and create a product that caters to them thanks to the tracking of the specific artificial intelligence aspects that the customer searched for and their unique attributes [12]. All things considered; AI enables the business to match product needs with client wants.

2.4 Artificial Intelligence in Distribution Management

Availability and the simplicity of purchasing the product and its components are two of the most essential factors for customers. There are a lot of routine, repetitive, automated tasks that make up the supply chain and are a part of distribution. Consequently, AI becomes crucial in assisting the company's management, who oversee overseeing the distribution activity and its ancillary tasks using various technological means [25]. Things include deploying drones, depending on robots to figure out the best way to package things, command, and control of transportation systems, as well as consumer-facing equipment and robots services provided by the government, for example, can be more adaptable and rely on machine learning, which boosts consumer satisfaction [26].

2.5 Artificial Intelligence in Promotion Management

Advertising campaigns and promotional content need careful planning and scheduling to be successful. The rise of digital marketing and social media marketing has revolutionized traditional advertising strategies by moving them online. Where things shifted various positions: these days, it's all up to the buyer in terms of when, when, and what he purchases [27].

2.6 Artificial Intelligence Application in Marketing

There are several AI applications utilized to support marketing activities, the first application is Chatbots. This term refers to computer programs that are designed to assist online customers with a variety of tasks, including answering their inquiries, providing support, and facilitating the completion of purchases [28]. In which cases, websites and social media profiles can incorporate chatbots. Chatbots make it easier for customers to engage with the brand and provide better service overall. These bots can handle a high volume of customers simultaneously, and support is available at all hours of the day and night [29]. Because of chatbots' low cost and effectiveness for clients, many firms have begun to rely on them [30]. The second application is Surfer SEO app, which refers to a comprehensive tool designed to assist content creators and digital marketers in optimizing their content for search engines. It provides analysis and insights based on key SEO factors like keyword usage, content structure, and the density of terms within the content. By analyzing over 500 on-page signals, Surfer SEO helps users align their content with ranking factors that are correlated with higher positions in SERPs. The application offers a user-friendly interface that recommends real-time adjustments for written content, making it more competitive and relevant to a target audience. It also has features for audit and content planning, which are instrumental in crafting an effective SEO strategy. With Surfer SEO, users can streamline their SEO efforts, ensuring that their digital content is not only high-quality but also fully optimized for better visibility and ranking on search engines [31, 32]. Moreover, using identifier tags, engagement, search history, and other digital actions, artificial intelligence systems can assess the customer's profile. Products' prices are thus calculated mechanically. Use of this technology allows hotel booking sites, travel agencies, and airlines to automatically adjust prices based on factors such as room occupancy rates, tourist season, past bookings, customer experience, and statistics. The third application is promotional personalization, using information about a user's location, age, gender, and other personal characteristics gleaned from their browser cookies and history, AI can provide highly personalized advertising [33]. You can see this in adverts on Google and social media platforms like Facebook and YouTube. In contrast, YouTube advertisements typically relate to what you were searching for or viewing on Google if you conduct a search and then visit the video-sharing website. In this scenario, algorithms powered by artificial intelligence examine a user's online behavior and search history to provide targeted adverts based on his interests and requirements [34, 35].

3 The Proposed Model

With the increase of the Internet, the number of products being marketed electronically with technology increases Internet pages; Artificial intelligence technology has emerged as one of the most important modern technologies that represents for,

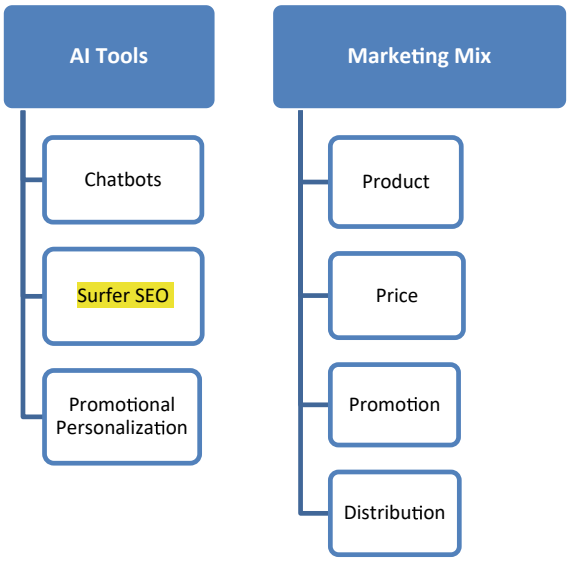


Fig. 1 The proposed model

which have been widely used in the field of marketing, through technology Companies and institutions to increase the effectiveness and success of their marketing process. With increasing development Technology: The world is moving towards investing in modern technologies, especially those related to intelligence. The enormous benefit and impact of applying artificial intelligence and the value it represents, considering AI on the domestic product is added to the companies that exploit it in all fields, in addition to the impact on global production. Because of the need to study and try to develop a model that links artificial intelligence tools and the elements of the marketing mix. The following figure represents a proposed model that can be used in all types of companies, regardless of whether they are local or international companies—as shown in Fig. 1.

4 Discussion

There are now only a few pilot projects using generative AI in marketing, and they are all quite simple to incorporate into current systems. Companies can now develop targeted marketing campaigns, reply, and connect with client feedback more efficiently, and produce content and graphics faster with the help of these technologies. On the other hand, these resources assist businesses cope with AI and build their AI skills for future usage, freeing up workers to concentrate on higher-priority activities. When compared to other technologies that could necessitate investments over

an extended period before they start to provide observable benefits, artificial intelligence's capacity to produce rapid and concrete outcomes is a major selling point for its inclusion in the marketing mix.

Because of artificial intelligence (AI), personalized marketing efforts are now a reality. Using AI to sift through unstructured client data has many advantages, not the least of which is the fact that specialized marketing stands to gain more from more precise analyses of consumer habits.

The scope of marketing process automation has expanded beyond its earlier incarnations. One of the most important things marketers do is help different parts of a company work together more effectively. More and more chances arise in today's businesses to automate interactions between marketing, sales, R&D, product development, and other departments, including legal reviews, thanks to modern technology. One use case for AI is helping direct-to-consumer retailers streamline processes like order processing and customer service. Using AI, tasks like automating data retrieval from the backend, making necessary adjustments, and reacting to clients in a manner consistent with the brand may be accomplished. A four-minute decrease in average issue resolution time and an eighty percent decrease in initial response time. Additionally, AI frees up the customer care crew to concentrate on more intricate interactions with clients. Media plans, quarterly reviews, strategic plans, and meeting agendas are just a few examples of the many marketing materials that could benefit greatly from being produced more efficiently.

To find new chances and ideas, businesses are turning to AI technology. Methods include researching market trends, polling customers, and evaluating potential new items. This method helps shorten the time it takes to bring new items to market, make testing more effective, and improve the efficiency of new products overall. Data mined from millions of online comments, images, and videos can help many businesses find untapped niches in the market and inspire new product developments.

As more and more businesses investigate the possibilities presented by AI, it's crucial that these initiatives align with their overall marketing goals. It can be challenging to effectively implement lessons learned when a multitude of AI-related projects are adopted without a sound plan, which can result in high costs and trouble tracking without reaching the desired outcomes. On the contrary, businesses would do well to zero in on a handful of use cases where the current state of artificial intelligence (AI) capabilities can have the most noticeable effect.

5 Conclusion and Recommendations

Insights generated by AI marketing tools provide valuable information about customer behavior, preferences, and trends, enabling businesses to make informed decisions and create targeted marketing strategies that resonate with their audiences. By harnessing the power of AI tools, companies can improve their marketing efforts, stay ahead of the competition, and build long-term customer relationships, artificial intelligence tools in marketing general and to use in improve the marketing mix is

considered a door that provides the opportunity for small business establishments, their services at the local and global levels, so these institutions must be developed Enabled by using communications technology and information. For companies and indirect electronic transactions and the necessary direct support for trade preparation. Rules, regulations, procedures, and wages to convert to electronic systems. The beneficiary shall serve the user 24 h a day during the design of the aviation companies' website, And 7 days in the week. Considering the conclusions we reached, we decided to use artificial intelligence tools to enhance the elements of the marketing mix.

To benefit from this, the researchers recommend the following recommendations:

Enhancing employees' awareness of modern tools and techniques for developing work. Requiring users of electronic marketing systems to use modern technology to quickly respond to customer services. Providing legislation and laws to govern artificial intelligence tools to ensure that personal data is not stolen and is Property rights. Providing all financial and material requirements in terms of the technologies used in companies. Benefiting from previous experiences that were applied in some developed countries. The training program for employees makes them more efficient in using advanced artificial intelligence techniques used in companies to enhance and increase the marketing mix. However, there are some ethical challenges still face us when using artificial intelligence in the marketing mix, including: high cost, deep technical expertise required, training data biases, inability to generalize, reducing the number of human-based jobs and increasing unemployment rates.

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Examining How the Quality of E-Government Services Influences Beneficiary Satisfaction: SANAD Application as a Case Study

Zakaria Azzam and Ayser Abu Ghazaleh

Abstract The purpose of the research is to examine the effect of electronic government services' quality on satisfaction of the beneficiaries through field study on "SANAD" application in Jordan. In order to achieve the objectives of the study, a descriptive-analytical approach is employed. A questionnaire consisting of 62 items was purposively distributed to 500 beneficiaries of the SANAD application, resulting in 450 responses that were used for analysis. The researchers utilized SPSS & Amos software to appropriately analyze the collected data using statistical methods. The findings of the study revealed that the dimensions of electronic government service quality, including ease of use, reliability, responsiveness, trust, privacy, and data security, have a significant impact on beneficiary satisfaction. Based on these findings, several recommendations are made. These include the need to enhance the quality of electronic government services across all dimensions, provide training programs and workshops for SANAD application operators to improve their skills in delivering high-quality electronic government services, establish transparent information provision to build trust between users and government entities, improve communication mechanisms with beneficiaries to better understand and meet their needs, and invest in technology development and necessary infrastructure to support the effective and secure delivery of electronic government services.

Keywords Electronic service quality · Electronic government services · SANAD application · Jordan

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1 Introduction

The advent of Information and Communication Technology (ICT) has brought about a significant transformation in the realm of information, serving as the principal benchmark for assessing a nation's advancement in the twenty-first century. This swift progress has resulted in a shift in conventional notions regarding modes of interaction between nations and organizations, enabling the surmounting of temporal and spatial constraints [1]. Consequently, ICT has assumed a crucial and impactful role in facilitating the execution of transactions and services at the national, organizational, and individual levels [5].

In order to enhance their services and ensure accessibility for beneficiaries, government organizations are increasingly recognizing the necessity of implementing electronic transformation [7]. This comprehensive program not only involves the integration of technology within the organization, but also encompasses the delivery of services to the target audience. Moreover, electronic transformation facilitates the interconnection of various government sectors, allowing for flexible collaboration and joint operations. The growing urgency for organizational electronic transformation can be attributed to the rapid advancement of information and communication technology (ICT) tools, which have become integral in both governmental and private transactions.

Government electronic services have dual benefits for both the government and its citizens. From the government's standpoint, these services offer significant advantages by saving time, money, and eliminating geographical limitations, thereby contributing to cost reduction [10]. On the other hand, citizens benefit from electronic services as they save time, effort, and money [2]. In recent years, the evaluation of electronic government services from the perspective of beneficiaries has emerged as a prominent area of interest for scholars and professionals. It is crucial to increase the number of beneficiaries utilizing electronic government services in order to ensure their effectiveness and success [7].

The SANAD application in Jordan functions as a conduit for individuals to access digital government services. It offers the convenience of using a single username and password, eliminating the need for multiple passwords. Moreover, it facilitates the establishment of a digital identity, allowing users to access government documents, apply for both governmental and private services, retrieve personal records, electronically sign documents, and make bill payments. Despite the impressive download count of 3.25 million, only 0.81 million beneficiaries have activated their digital identities.

The decline in the number of individuals benefiting from government electronic services may be attributed to the overall quality of these services across various dimensions such as ease of use, reliability, responsiveness, trust, privacy, and data security, as highlighted in a study conducted by [21]. A went further into detail, explaining that user satisfaction with e-government services is essentially a psychological yardstick. It is based on how users cognitively evaluate their past interactions with the government's electronic platform. Consequently, the present study primarily

focuses on assessing the quality of government electronic services provided through the Sanad application as an indicator of beneficiary satisfaction with these services.

1.1 The Problem of the Study and Its Questions

The "Sanad" application serves as a portal for individuals in Jordan to access various government electronic services. By using a single username and password, users can conveniently log in without the need for multiple passwords. This platform allows individuals to establish a digital identity, granting them access to government electronic documents, the ability to apply for both government and private sector services, view personal records, electronically sign documents, and make bill payments. However, according to a report by the United Nations Economic and Social Commission for Western Asia (UNESCWA) in 2022, the utilization rate of the service and overall satisfaction among beneficiaries was only 56.09%. This ranking places Jordan fifth out of the 19 Arab countries assessed. There are certain technological challenges that stand as barriers to the e-government setup in Jordan: a dearth of shared standards between departments and their infrastructural compatibility, stifling coordination. It is not just that though; there is also this looming cloud of doubt when it comes to privacy and security for those who stand to benefit [5]. These obstacles seem to be scaring people off from using the Sanad application despite an impressive pool of over 6 million possible users (Sanad, 2024). These challenges have led to a decrease in active participants on Sanad, even with such an enormous potential user base.

Several researchers including [10, 17, 18] have pointed out the various dimensions of e-government service quality that could majorly affect the satisfaction of the recipients. These dimensions include ease of use, reliability, response time, trust, privacy and data security.

Based on the above, the research problem can be formulated with the following questions:

Main question: What is the impact of the quality of Jordanian e-government services through the Sanad application on beneficiary satisfaction?

1.2 Study Objectives

The study aims to identify:

1. The impact of the quality of Jordanian e-government services through the Sanad application on beneficiary satisfaction.
2. The impact of the ease of use of Sanad application services on beneficiary satisfaction.

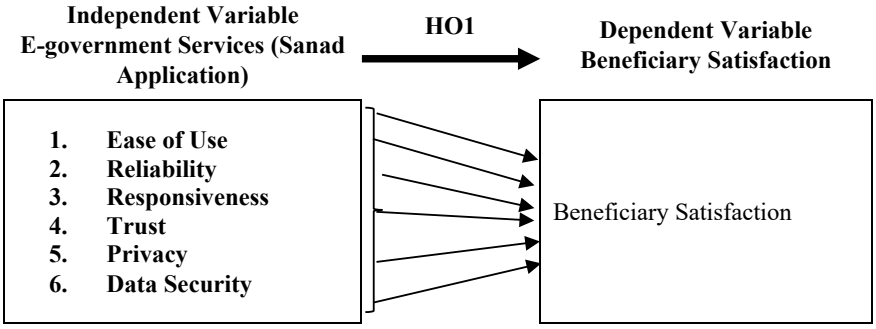


Fig. 1 Study model

3. The impact of the reliability of Sanad application services on beneficiary satisfaction.
4. The impact of the responsiveness of Sanad application services on beneficiary satisfaction.
5. The impact of trust in Sanad application services on beneficiary satisfaction.
6. The impact of privacy in Sanad application services on beneficiary satisfaction.
7. The impact of data security in Sanad application services on beneficiary satisfaction.

1.3 Study Model

Based on the findings of [1, 3, 5, 9–14, 9–14, 21], and after making adjustments suitable for the current study, the study model has been designed as shown in Fig. 1.

1.4 Study Hypotheses

The study hypotheses can be formulated as follows:

- Main Hypothesis (H01): "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) of the quality of Jordanian e-government services through the Sanad application on beneficiary satisfaction."

2 Theoretical Framework

- **Service Quality**

Beneficiary satisfaction, as defined, is the culmination of beneficiaries' assessment of the service institution's performance in relation to their expectations. This assessment involves comparing their perceived needs with the actual service provided. The operational definition of beneficiary satisfaction in the context of the Sanad application is the variance between the anticipated service prior to usage and the experienced service after usage. This variance is gauged using a scale consisting of 45 statements.

- **E-government**

According to Joghi and Atiya (2020), e-government refers to the utilization of information and communication technology, such as computers, communication networks (specifically the internet), software, and other related tools, to deliver government services and engage in democratic interactions with citizens (p. 157). In the context of Jordan, e-government is operationally defined as the initiatives undertaken by the relevant authorities to provide government services through the Sanad application, with the aim of enhancing efficiency, reducing resource expenditure, and saving time for the beneficiaries.

- **Beneficiary Satisfaction**: The assessment of service quality is determined by the degree to which the beneficiary's desires are met, as they evaluate the obtained outcomes against their initial expectations [15], In the context of the Sanad application, service quality is operationally defined as the level of satisfaction experienced by beneficiaries in relation to their specific needs and desires. This measurement is based on a range of statements, spanning from 45 to 62.
- **Ease of Use**: The idea being looked at is introduced by [18] and focuses on people's skill level in using e-government portals regardless of age and educational backgrounds (p. 1446). Features in the operational definition of this term are the features and services available in the Sanad application that provide easy access and navigation, and are rated for differences in instructions ranging from one to four.
- **Reliability**: According to [18] this "ability to engender trust among users through the provision of services" is fundamental to an e-government portal. This capability is operationally measured as the degree to which it enables beneficiaries to transact with the government through the Sanad application, measured on a five-point scale and aggregated across five statements.
- **Responsiveness**: A very important feature of an effective e-government portal is its ability to provide the service to the user in a timely manner [16, 21]. This idea is defined in practice as how well the Sanad application can deliver its services without any delay to the beneficiaries which is determined by various statements covering items 14–20.
- **Trust**: The accurate and reliable provision of services by an e-government portal is a crucial factor [3, 4, 10, 15]. In this study, the operational definition of this factor refers to the extent to which beneficiaries of the Sanad application perceive that it effectively fulfills the objectives of the service. This perception was measured using a set of statements ranging from 21 to 29.

- **Privacy**: The concept being discussed pertains to the ethical practice of refraining from utilizing the personal information and transactional behaviors of beneficiaries in electronic transactions for any purposes beyond those related to business activities. In operational terms, this refers to the degree to which the Sanad application preserves the data of beneficiaries without engaging in any secondary utilization, and this is assessed through the examination of statements ranging from 30 to 37.
- **Data Security**: The concept of cybersecurity refers to the capacity of electronic services to effectively safeguard against unauthorized access, particularly in relation to financial information. In this study, cybersecurity is operationalized as the level of challenge encountered by potential intruders when attempting to breach the Sanad application and access users' data. This measure is assessed using a range of statements, specifically from item 38 to item 45.

3 Study Methodology

The methodology employed in this study is descriptive and analytical in nature. It involves the utilization of a model derived from existing research, which is then assessed through the development of a questionnaire designed to measure the variables represented by the model. This questionnaire is subsequently administered to a representative sample. To test the hypotheses formulated in this study, statistical software such as SPSS (version 22) and AMOS (version 23) will be employed. The following section provides a comprehensive overview of the key elements comprising the adopted methodology and the tools utilized within it.

3.1 Study Population and Sample

The scope of this study encompasses individuals who utilize e-government services in Jordan. Enumerating the entire study population presents a challenge; therefore, following the guidelines of [20] was observed; they suggest a sample size ranging from 30 to 500. This study will adopt a purposive sampling approach to select a sample size of 500 e-government service beneficiaries in Jordan.

3.2 Study Instrument

In order to accomplish the objectives of the study, a comprehensive review of previous research studies [2, 7] was conducted. Subsequently, a tool was developed to assess the influence of e-government service quality on beneficiary satisfaction. The measurement instrument comprises three primary dimensions. To establish the

Table 1 Cronbach's alpha reliability coefficient

Study variables	Number of items	Cronbach's alpha reliability coefficient
Ease of use	4	0.823
Reliability	9	0.895
Responsiveness	7	0.860
Trust	9	0.893
Privacy	8	0.887
Data security	8	0.889
Beneficiary satisfaction	17	0.942

reliability of the instrument, Cronbach's alpha coefficient was employed for each variable in the study. The obtained results are presented in Table 1.

The reliability coefficients of all study variables, as shown in Table 1, exceed the threshold of 0.70. This suggests that the instrument is appropriate for attaining the study objectives and can be effectively applied [20].

3.3 Descriptive Analysis of the Study Sample

450 responses were obtained, which is an impressive 90% response rate out of the needed sample size. We have created Table 2 to show the demographics and general characteristics of the participants, including gender, age, education level, residence, and service type. The table presents the frequencies and percentages of these details. This data was collected to provide an accurate representation of the general information within our study sample without any bias or misrepresentation, ensuring that all numbers depicted are truthful reflections on those surveyed.

3.4 Description of Study Variables

In detail, to comprehend the study sample's responses regarding each dimension item by using mean scores and standard deviations as follows:

E-Government Services

- **Ease of Use**: The arithmetic means and standard deviations of the sample's responses to the "Ease of Use" dimension items were calculated, arranged in descending order of mean scores, as shown in Table 3.

The descending order of paragraphs in the "Ease of Use" dimension, as determined by the study sample, is presented in Table 3. The paragraph that ranked first in terms of ease of use is "It is easy for me to identify the services provided by the Sanad

Table 2 General information of the study sample

Item	Description	Frequency	Percentage (%)
Gender	Male	270	60.0
	Female	180	40.0
	Total	450	100.0
Age	Less than 25 years	36	8.0
	25 to less than 35 years	93	20.7
	35 to less than 45 years	126	28.0
	45 to less than 55 years	117	26.0
	55 years and above	78	17.3
	Total	450	100.0
Education	Secondary or less	42	9.3
	Diploma	114	25.3
	Bachelor's degree	150	33.3
	Postgraduate studies	144	32.0
	Total	450	100.0
Residence	Rented	87	19.3
	Owned	243	54.0
	With family	84	18.7
	Other	36	8.0
	Total	450	100.0
Service type	Personal data	156	34.7
	Financial services	84	18.7
	Inquiries	108	24.0
	Other	102	22.7
	Total	450	100.0

Table 3 Arithmetic means and standard deviations of the study sample's responses to items on the ease of use dimension

Item	Paragraph	Mean	Standard deviation	Rank
1.	It is easy for me to identify the services provided by the Sanad application	4.15	0.815	1
2.	There is ease in navigating the Sanad application	4.06	0.819	3
3.	The Sanad application is compatible with all types of mobile phones	4.07	0.831	2
4.	The Sanad application requires minimal data effort to log in	3.81	0.949	4
Ease of use		4.02	0.691	

application," with an arithmetic mean of 4.15 and a standard deviation of 0.815. Conversely, the paragraph that ranked last in terms of ease of use is "The Sanad application requires minimal data effort to log in," with an arithmetic mean of 3.81 and a standard deviation of 0.949. For "Ease of Use" dimension, it is determined that the overall arithmetic mean is 4.02 while the deviation is 0.691.

- **Reliability:** To evaluate the dimension of "Reliability," responses from the study sample paragraphs were analyzed for their mean and standard deviation using a methodology that ensured clear presentation. After organizing these values in a descending order with respect to the arithmetic means, they were tabulated as shown in Table 4.

Based on responses from the study sample, the paragraphs are presented in descending order of their rank in the "Reliability" dimension as shown in Table 4. The paragraph identified as "Sanad application effectively meets the needs of beneficiaries" garnered the highest position with an average of 4.07 and a standard deviation of 0.768. Conversely, the paragraph denoted by "Effective technical support is provided to beneficiaries to resolve any technical issues that may arise while using the Sanad

Table 4 Arithmetic means and standard deviations of study sample responses to paragraphs in the reliability dimension

Item	Paragraph	Mean	Standard deviation	Rank
1.	Sanad application is a suitable alternative for delivering government services	3.93	0.889	6
2.	Sanad application provides timely services to beneficiaries	4.02	0.861	3
3.	Sanad application provides effort-saving services to beneficiaries	4.05	0.868	2
4.	Sanad application provides cost-effective services to beneficiaries	3.95	0.868	5
5.	Sanad application effectively meets the needs of beneficiaries	4.07	0.768	1
6.	Sanad application is regularly updated to improve performance and ensure continuity of service provision	3.89	0.835	7
7.	Sanad application features an innovative and advanced user interface that facilitates interaction and engagement with services	4.01	0.788	4
8.	Modern technologies are available in the Sanad application to prevent unexpected technical interruptions	3.85	0.893	8
9.	Effective technical support is provided to beneficiaries to resolve any technical issues that may arise while using the Sanad application	3.75	0.904	9
Reliability		3.94	0.629	

application" acquired the lowest rank having an average of 3.75 and a standard deviation of 0.904. The total mean value for the "Reliability" dimension was computed at 3.94 along with a standard deviation of 0.629.

- **Responsiveness:** To evaluate the "Responsiveness" aspect, arithmetic means and standard deviations were computed for the sample responses to the paragraphs. The values were then sorted in a descending order according to the arithmetic means which can be seen in Table 5.

The results of the study sample's feedback indicate that Table 5 displays the paragraphs in the "Responsiveness" dimension in descending order. The paragraph with the highest rating was "Services of the application can be utilized at any time," scoring an average of 4.07 and a standard deviation of 0.802—placing it at the top position based on respondents' evaluations. On the other hand, the paragraph "Sanad

Table 5 Arithmetic means and standard deviations of study sample responses to paragraphs in the responsiveness dimension

Item	Paragraph	Mean	Standard deviation	Rank
1.	Services of the application can be utilized at any time	4.07	0.802	1
2.	Connectivity to the service remains uninterrupted during the use of the Sanad application	3.85	0.847	3
3.	Any inquiries about Sanad application services can be responded to promptly	3.84	0.858	4
4.	Sanad application provides outstanding customer service, where inquiries from beneficiaries are handled efficiently and quickly	3.84	0.850	5
5.	Sanad application offers online training courses to enhance beneficiaries' skills in using the application	3.74	0.935	7
6.	Sanad application is regularly updated based on beneficiaries' feedback to meet their expectations and improve their experience	3.89	0.830	2
7.	Instant notifications and updates are provided to beneficiaries when there are updates or changes in Sanad application services	3.81	0.901	6
Responsiveness		3.86	0.635	

application offers online training courses to enhance beneficiaries' skills in using the application" obtained the lowest ranking with an arithmetic mean of 3.84 and a standard deviation of 0.850. The overall arithmetic mean for the "Responsiveness" dimension was 3.86, with a standard deviation of 0.901.

- **Trust:** In order to assess the "Trust" dimension, the research team calculated the arithmetic means and standard deviations of the participants' responses to the paragraphs in the study sample. These values were then organized in descending order based on the arithmetic means, as presented in Table 6.

In accordance with the study responses, the descending order of paragraphs within the "Trust" dimension is presented in Table 6. The paragraph that received the highest

Table 6 Arithmetic means and standard deviations of study sample responses to paragraphs in the trust dimension

Item	Paragraph	Mean	Standard deviation	Rank
	The information I receive from the Sanad application is accurate	4.21	0.822	1
	I trust conducting financial transactions through the Sanad application	3.99	0.861	3
	Transactions through the Sanad application are conducted accurately	3.93	0.889	4
	Strong identity verification mechanisms are provided on the Sanad application, enhancing trust in sensitive operations such as financial transactions	4.03	0.876	2
	Transparent details are provided about the security procedures and encryption used in the Sanad application to protect beneficiaries' data	3.84	0.834	9
	The Sanad application demonstrates commitment to security standards and obtains necessary certifications to confirm compliance	3.93	0.818	5
	Beneficiaries are given the ability to manage access permissions and control the sharing of their data on the Sanad application	3.73	0.878	9
	Regular updates are provided about the security measures taken in the Sanad application to address security threats	3.81	0.893	7
	The Sanad application enhances beneficiaries' awareness about the importance of adopting strong security measures while using the application	3.81	0.847	8
Trust		3.920	0.629	

rank, with an average score of 4.21 and a standard deviation of 0.822, is "The information I receive from the Sanad application is accurate." On the other hand, the paragraph that obtained the lowest rank is "Transparent details are provided about the security procedures and encryption used in the Sanad application to protect beneficiaries' data," with an average score of 3.73 and a standard deviation of 0.878. The "Trust" dimension achieved an average score of 3.92, with a standard deviation of 0.629.

- **Privacy:** The statistical means and standard deviations of the survey responses were computed and arranged in descending order to determine the rankings for the "Privacy" dimension. The findings are displayed in Table 7.

According to the responses of the study sample, the paragraphs related to the Privacy dimension were ranked in descending order as shown in Table 7. The paragraph that ranked first with an average score of 3.96 and a standard deviation of

Table 7 Arithmetic means and standard deviations of the study sample's responses to the privacy dimension items

Item	Paragraph	Mean	Standard deviation	Rank
	The Sanad application maintains the confidentiality of the information provided by the beneficiaries	3.96	0.909	1
	My personal data is kept from being shared with other parties	3.92	0.907	3
	I believe that the Sanad application respects the privacy of the beneficiaries	3.93	0.878	2
	Clear notifications are provided to the beneficiaries about any changes in the privacy policies on the Sanad application	3.85	0.831	5
	Data sent and received through the Sanad application is encrypted to maintain the confidentiality of personal information	3.81	0.898	7
	The Sanad application allows beneficiaries to control their privacy settings and choose the extent of sharing their data	3.87	0.847	4
	The technical support team is trained to protect the privacy of the beneficiaries and handle privacy-related inquiries sensitively	3.85	0.821	6
	Additional measures are taken to protect the data of the beneficiaries in case of breaches such as security breaches	3.79	0.814	8
	The Sanad application maintains the confidentiality of the information provided by the beneficiaries	3.87	0.909	1
Privacy		3.87	0.645	

0.909 was "The Sanad application maintains the confidentiality of the information provided by the beneficiaries." On the other hand, the paragraph that ranked last with an average score of 3.79 and a standard deviation of 0.814 was Additional measures are taken to protect the data of the beneficiaries in case of breaches such as security breaches. The Privacy dimension had an average score of 3.87, with a standard deviation of 0.645.

- **Data Security:** The arithmetic means and standard deviations of the study sample's responses to the paragraphs pertaining to the "Data Security" dimension were computed and organized in a descending order based on the arithmetic means, as illustrated in Table 8.

Table 8 Arithmetic means and standard deviations of the study sample's responses to the paragraphs related to the "Data Security" dimension

Item	Paragraph	Mean	Standard deviation	Rank
	I believe that the Sanad application cannot be penetrated by external parties	3.77	0.889	7
	Sophisticated programs are used to protect the data of beneficiaries from the Sanad application	3.84	0.834	3
	It is difficult for anyone to access my account on the Sanad application without my knowledge	3.81	0.847	4
	Regular security audits and continuous scans are conducted to verify the Sanad application and ensure compliance with the highest security standards	3.85	0.831	1
	Regular security updates are provided for the Sanad application to counter new security threats and improve protection effectiveness	3.79	0.875	5
	Strict security measures are implemented when transferring data between components of the Sanad application to prevent interception or manipulation	3.85	0.855	2
	Data storage policies on the Sanad application are enhanced to maintain the confidentiality of information and reduce security risks	3.79	0.892	6
	Advanced intrusion detection systems are deployed on the Sanad application to detect any unauthorized attempts to breach the system	3.77	0.777	8
Data security		3.80	0.638	

Based on the responses from the study sample, the "Data Security" dimension was analyzed and ranked in descending order, as shown in Table 8. The paragraph that received the highest mean score of 3.85 and a standard deviation of 0.831 was "Regular security audits and continuous scans are conducted to verify the Sanad application and ensure compliance with the highest security standards." On the other hand, the paragraph with the lowest mean score of 3.77 and a standard deviation of 0.777 was "Advanced intrusion detection systems are operated on the Sanad application to detect any unauthorized attempts to breach the system." Overall, the average mean for the "Data Security" dimension was 3.8, with a standard deviation of 0.638.

3.5 Comparison of Mean Scores for Independent Variable Dimensions

Upon careful examination of the participants' responses to various aspects of the independent variable, namely electronic government services, a comparative analysis was conducted to ascertain the rankings of these dimensions based on the mean scores derived from the study sample. The corresponding findings are presented in Table 9.

According to the responses of the study sample, the dimensions of the E-Government Services axis are presented in descending order in Table 9. The dimension "Ease of Use" obtained the highest rank with a mean (arithmetic average) of (4.02) and a standard deviation of (0.691). Conversely, the dimension "Data Security" obtained the lowest rank with a mean (arithmetic average) of (3.9) and a standard deviation of (0.571). The E-Government Services axis had a mean (arithmetic average) of (3.9) and a standard deviation of (0.571).

Beneficiary Satisfaction

The researchers computed the arithmetic means and standard deviations of the participants' responses in the study sample pertaining to the adjusted variable, namely

Table 9 Mean scores and standard deviations of the study sample responses on the axis of electronic government services

No.	Dimension	Mean (Arithmetic Average)	Standard deviation	Rank
1.	Ease of use	4.02	0.691	1
2.	Reliability	3.94	0.629	2
3.	Responsiveness	3.86	0.635	5
4.	Trust	3.92	0.629	3
5.	Privacy	3.87	0.645	4
6.	Data security	3.80	0.638	6
E-government services		3.90	0.571	

Beneficiary Satisfaction. These values were then organized in a descending order based on the arithmetic means, as illustrated in Table 10.

According to the responses of the study sample, Table 10 presents the items of the Beneficiary Satisfaction axis in descending order. The item that received the highest ranking was "I recommend my family and friends to use the Sanad app," with a mean (arithmetic average) of (4.24) and a standard deviation of (0.878). On the other hand, the item "I can easily transfer my data in the Sanad app from one mobile phone to another" received the lowest ranking, with a mean (arithmetic average) of (3.81) and a standard deviation of (0.878). The mean (arithmetic average) for the Beneficiary Satisfaction axis was calculated to be (3.96), with a standard deviation of (0.590).

4 Testing Study Hypotheses

The study employed a tool that was constructed based on a series of hypotheses, with four fundamental hypotheses being put forth. The data analysis was conducted using the Structural Equation Modeling (SEM) technique, following a methodology that adheres to the statistical significance criterion ($\alpha \leq 0.05$). The subsequent section provides an elucidation of the findings derived from the hypothesis testing.

4.1 Testing the Main Study Hypothesis

- H01: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of the quality of Jordanian e-government services of the Sanad app on beneficiary satisfaction." The results of the hypothesis testing are shown in Table 11.

From Table 11, we conclude the following:

- The coefficient of correlation, which measures the extent of the association between the quality of e-government services and beneficiary satisfaction, was determined to be 0.872.
- The coefficient of determination (R2), representing the proportion of the variance in beneficiary satisfaction attributed to the quality of e-government services, was found to be 76.1%
- The hypothesis testing (ANOVA) utilized the F value to assess the influence of the collective dimensions of e-government service quality on beneficiary satisfaction. The obtained F value was (235.033), surpassing the critical value of (2.0986). Moreover, the p-value was determined to be (0.00), indicating statistical significance at a significance level of ($\alpha \leq 0.05$). Therefore, it can be concluded that the quality of Jordanian e-government services provided by the Sanad app has a statistically significant impact on beneficiary satisfaction.

Table 10 Arithmetic means and standard deviations of the study sample responses on the items of the beneficiary satisfaction axis

No.	Dimension	Mean (Arithmetic Average)	Standard deviation	Rank
1.	I recommend my family and friends to use the Sanad app	4.24	0.8780	1
2.	I know well the advantages of using the Sanad app	3.95	0.8120	9
3.	The Sanad app has helped me interact more with government services	3.97	0.8410	5
4.	The Sanad app is a convenient way to benefit from government services	3.93	0.8930	11
5.	All the data provided by the Sanad app is up-to-date	4.03	0.8130	4
6.	The general appearance of the Sanad app is easy on the eyes	3.96	0.8000	6
7.	The Sanad app is suitable for all mobile phone sizes	3.93	0.8100	12
8.	I can easily transfer my data in the Sanad app from one mobile phone to another	3.81	0.8780	17
9.	Overall, I am satisfied with the services of the Sanad app	3.95	0.9200	10
10.	The customization features in the Sanad app effectively meet the needs and preferences of beneficiaries	3.93	0.8390	13
11.	The Sanad app contributes to providing simplified government services available 24/7, enhancing user comfort	4.05	0.8440	3
12.	The Sanad app offers up-to-date and accurate content, enhancing user satisfaction with the quality of information provided	3.90	0.8630	15

(continued)

Table 10 (continued)

No.	Dimension	Mean (Arithmetic Average)	Standard deviation	Rank
13.	The design of the Sanad app is suitable for various screen sizes on mobile devices, improving user experience	3.96	0.8160	7
14.	The Sanad app enhances the inclusiveness of government services, enabling users of different age groups and educational levels	3.90	0.8320	16
15.	Customer support on the Sanad app is exceptional, effectively and promptly addressing user inquiries and issues	3.96	0.7740	8
16.	The Sanad app is flexible and integrable, allowing users to benefit from a wide range of government services	3.92	0.7880	14
17.	The features of the Sanad app contribute to improving the efficiency of users in utilizing government services more effectively	4.09	0.7570	2
Beneficiary satisfaction		3.96	0.5900	

Table 11 The results of the hypothesis testing

Model summary		ANOVA		Dimensions of the independent variable	Unstandardized coefficients	Standardized coefficients	Regression weight	
R	R^2	F	P-value		B	Beta	C.R	P-value
0.872	0.761	235.033	0.000	Ease of use	0.131	0.154	4.034	0.000
				Reliability	0.247	0.263	5.677	0.000
				Responsiveness	0.143	0.154	3.177	0.0010
				Trust	0.204	0.217	4.596	0.000
				Privacy	0.037	0.041	0.909	0.363
				Data security	0.135	0.146	3.227	0.001

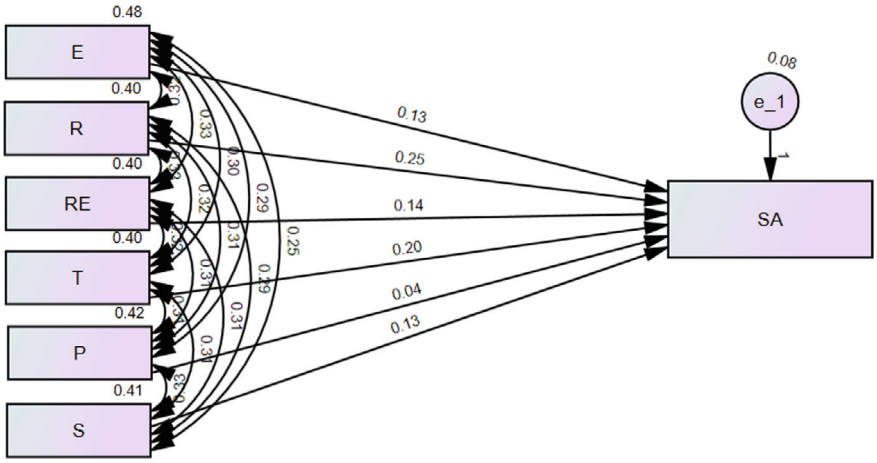


Fig. 2 Main hypothesis testing model

- The findings from the variance analysis indicate a significant association between the composite dimensions of e-government service quality, encompassing Ease of Use, Reliability, Responsiveness, Trust, Privacy, and Data Security, and the level of satisfaction experienced by beneficiaries.
- Based on the critical ratio (C.R) analysis, it was found that the combined dimensions of e-government service quality, including Ease of Use, Reliability, Responsiveness, Trust, and Data Security, exhibited calculated values that exceeded the tabulated value of 1.96. This suggests a significant effect of these dimensions when considered together. However, the Privacy dimension yielded a calculated C.R value of 0.909, which is lower than its tabulated value. This indicates that this dimension does not have a significant impact when evaluated alongside the other dimensions. However, it is possible that its influence may become apparent when examining the sub-hypothesis associated with it. The model for testing the main hypothesis is illustrated in Fig. 2 where E = ease of use, R = reliability, Re-responsiveness, T = trust, P = privacy, S = datasecurity.

5 Study Recommendations

Based on the previous findings, the study recommends the following:

- Efforts should be made to improve the quality of government e-services in all dimensions, including ease of use, reliability, responsiveness, trustworthiness, privacy and data security, through the development of training programs and workshops for employees to enhance their skills in delivering high-quality services. High-quality e-government services.

- Steps should be taken to increase trust between users and government entities by providing comprehensive and transparent information about their electronic services and operations by improving communication mechanisms with beneficiaries to understand and better meet their needs.
- Investment in technology development and the necessary infrastructure should be increased to support the efficient and secure delivery of e-government services by continuously improving security and data protection systems to ensure beneficiary privacy and information security.
- Targeted awareness and education campaigns for users should be developed on the use and benefits of e-government services through the Sind application, and educational materials on personal data protection and digital security practices should be disseminated to users.
- More incentives and incentives should be provided to beneficiaries to use the "Sind" application by enhancing their experience and providing quality services by providing more electronic government services and facilitating access to them according to the needs of beneficiaries.

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Navigating Digital Banking Transformations: Insights from a Systematic Literature Review



Belal Yousef Aqel and Rani Shahwan

Abstract This study addresses the existing gap in the literature by investigating digital banking transformation and exploring the key factors and effective strategies essential for its implementation. The research aims to contribute valuable insights for future research directions. The comprehensive analysis conducted in this study examines the factors and strategies that influence digital banking, providing crucial insights for banks, Fintech companies, and policymakers. Through a systematic review, this study identifies fundamental changes in digital transformation components, including the redefinition of business processes leading to the creation of new business models. Furthermore, an in-depth analysis of factors influencing digital banking adoption by banks reveals both internal and external factors. Internal factors encompass technological infrastructure, investments in technology, and the development of digital banking applications and services. External factors include economic conditions, competition between banks, and government regulations. However, customers remain central to both internal and external factors, with considerations such as awareness, cultural knowledge, and the advantages of digital banking services being integral to quality service provision. Additionally, factors such as risks, security, trust, and user-friendly interfaces are crucial for fostering customer adoption.

Keywords Digital transformation · Banking · Business models · Fintech · Technology

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1 Introduction

In recent years, there has been a noticeable shift towards financial technology, significantly altering the traditional landscape of banking operations across various services in tandem with modern technologies and business models. The concept of banking has evolved beyond the confines of designated branches that customers visit to access banking services. Instead, banking services have become readily accessible through electronic channels, including Automated Teller Machines (ATMs), Interactive Teller Machines (ITMs), Interactive Voice Response (IVR) systems, and Mobile Apps [1]. Digital banking encompasses a range of services offered online through these electronic channels, encompassing account management, financial services, and payments. The popularity of digital banking among customers has surged due to factors such as the widespread availability of the internet and smartphones, as well as shifts in customer purchasing behaviors.

Numerous studies have delved into the factors influencing the adoption of digital banking and user acceptance of technology [2]. Encouraging individuals and businesses to utilize these digital tools enhances their ability to access financial services efficiently, reducing costs and saving time amidst the rapid global technological advancements [3]. However, challenges persist, including limited technological infrastructures, low awareness and cultural acceptance of digital banking, and the high costs associated with digital banking investments [4].

Digital Banking Transformation (DTS) has emerged as a prominent concept worldwide, aiming to transition banking business models to digital platforms to maintain a competitive edge and provide superior customer experiences by digitizing products and services [5]. DTS involves integrating information technology into business processes and converting transactions into electronic formats, with the goal of realizing both short-term and long-term benefits. These benefits include enhanced customer service, the ability to meet customer expectations, and improved consistency across all channels [6].

Recent years have seen a rapid expansion of digital banking services, attracting customers of all ages and economic backgrounds. This growth can be attributed to many factors, including the spread of the internet and smartphone devices, technological advancements in digital banking, and shifts in consumer purchasing behaviors. This study seeks to provide a comprehensive analysis of the factors and strategies contributing to the adoption of digital banking transformation.

The primary objective of this study is to conduct a systematic literature review aimed at identifying best practices for implementing digital banking strategies by comprehensively understanding the factors that influence digital banking adoption. The research seeks to address the gap in literature of studies up to date which is the real factors and effective strategies in implementing digital banking transformation offer essential recommendations to stakeholders involved in promoting digital banking, including financial institutions, Fintech companies, and policymakers.

Despite the global spread of digital banking, there exists a notable lack of understanding regarding the complex factors and strategies that influence its adoption.

This study aims to address the following key questions. What are the components of digital banking transformation? What are the key factors and strategies that impact the adoption of digital banking transformation?

2 Research Methodology

To conduct the systematic literature review, relevant keywords were searched in the Web of Science database (WOS) to identify studies and previous research related to digital banking transformation. Subsequently, a set of selected articles were analyzed using Web of Science tools and VOS Viewer software, focusing on addressing the main research questions: What are the components of Digital Transformation Systems (DTS), and what are the factors and strategies that influence digital banking transformation?

Following the identification of articles relevant to factors and strategies influencing digital banking transformation, the search for publication articles was limited to the period from 2014 to 2023 within the Web of Science portal, managed by Clarivate. The search was conducted using the main keywords or expressions, "Digital Banking Transformation" and "Adoption," which yielded 87 documents. After reviewing and assessing the contents, 27 articles were excluded, resulting in 60 articles retrieved and analyzed to explore the components of digital banking transformation. From these, 21 documents were identified as exploring the factors and strategies influencing digital banking transformation. It is important to note that only articles published in English were considered, while others were excluded. Additionally, articles presenting similar ideas were not included to avoid duplication in the analysis as shown in Fig. 1.

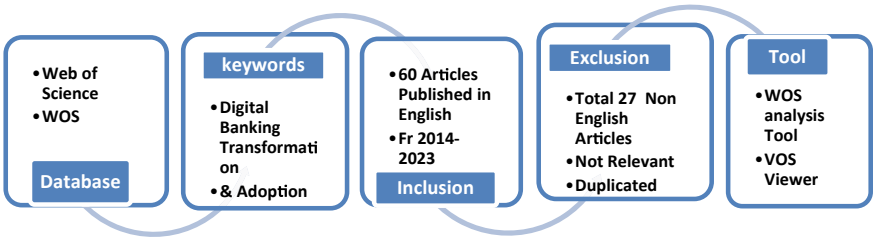
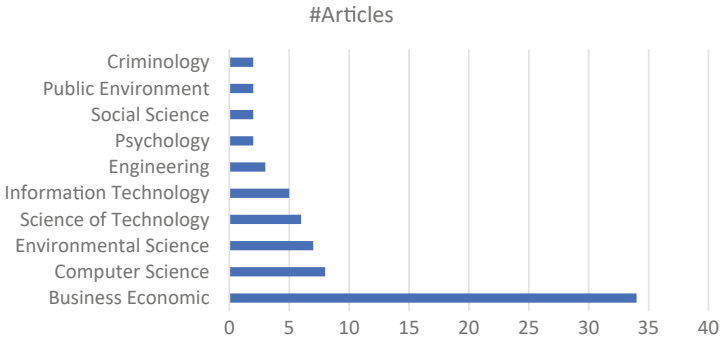


Fig. 1 Phases of systematic literature review

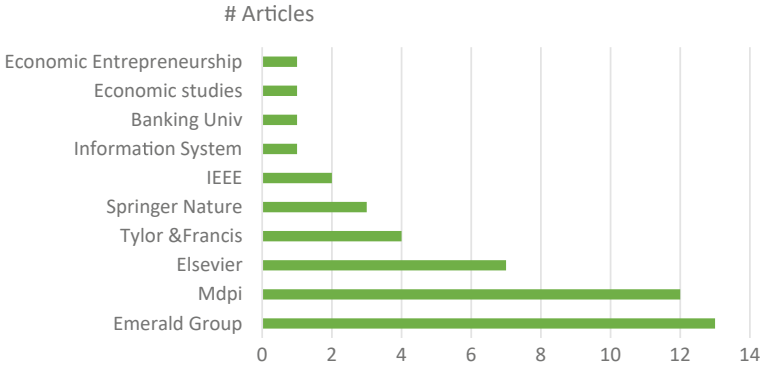
2.1 Bibliometric Analysis

The search in web of science core collections showing that research articles for digital banking transformation distributed based on area of research, years, publisher and country as shown in Fig. 2a, b and 3.

Keywords meet threshold as per below figure concluded that digital transformation adoption determinants by innovation & technology which encompasses mobile banking, internet banking while the factors and impact of this acceptance of information technology based on usefulness and trust, meanwhile the management performance is main part of adopting digital banking transformation as shown in Fig. 4.



(a) Distribution of articles according to area of researches .



(b) Distribution of articles according to publisher.

Fig. 2 **a** Distribution of articles according to area of researches. **b** Distribution of articles according to publisher

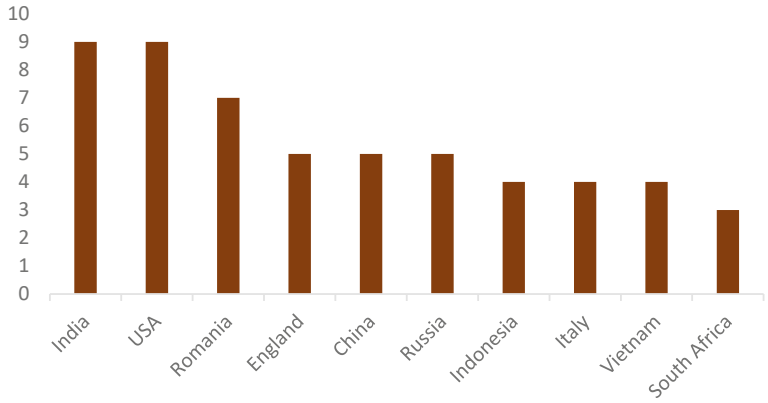


Fig. 3 Distribution of articles according to number of articles and country wise

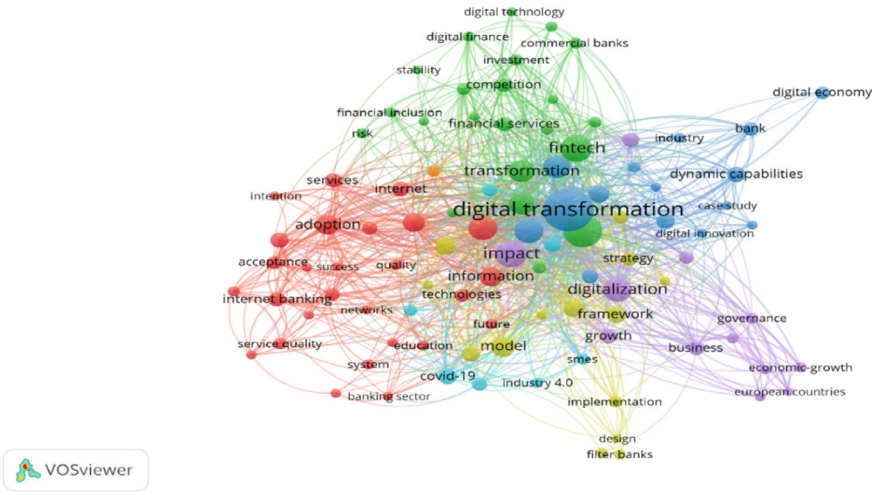


Fig. 4 Vos viewer key words DTS components, adoption determinants

3 Literature Review

The most valuable outcomes of digital transformation encompass a range of dimensions, including operational efficiency, enhanced customer experience, risk management, strategic decision-making and ultimate cost efficiency [7].

Senior managers from both business and information technology domains collaborate in driving digital transformation initiatives. They prioritize customer-centric approaches, resource fulfillment, innovation, and effective governance to ensure success [8]. Strategies focused on convenience, security, trust, and ease of use are

essential for catering to senior clients, as per the Technology Acceptance Model, thereby enhancing the e-banking experience [9].

Digital banking transformation is recognized as a crucial factor in fostering economic development [10]. Senior management policies are key success factors in supporting digital transformation implementation, encompassing people, processes, and innovative products and services [11]. Digital banking transformation reflects bank performance, future sustainability, and net profit outcomes, particularly in the post-COVID-19 pandemic context [12], Banks using AI to determine if the purchase was made the customer by analyzing and identifying unfamiliar patterns [13].

According to an article published by Naimi, financial institutions require clear organizational structures and cultures aligned with digital transformation strategies, supported by adequate resources and capabilities [14]. Another study has referred to intrinsic, frictional, and transitional frames, depicting the cognitive progression of end-users when interacting with digital artifacts and navigating institutional complexity [15].

Emerging trends in digital technology usage bring forth new risks related to processes, competition among banks, and market efficiency [16]. Increased customer demand for automated and self-services drives digital economy development, with factors such as risk and security, ease of use, and cost influencing digital banking transformation [17]. Banks heavily involved in digital transformation efforts intensify their competitive positions and achieve greater profitability [18].

4 The Components of Digital Banking Transformation

According to literature review conducted the components has been drafted as below shown Table 1 according to specific titles followed by academic articles assigned to each headline.

5 Navigating Factors and Strategies in Digital Banking Transformation: Insights and Implications

The factors that affect the adoption of digital banking by customers include risks, ease of use, usefulness, cost, and security. However, customers are particularly concerned about cybersecurity risks and trust, while features such as reliability and realty also influence their adoption of digital services [43]. The enhancement of mobile banking applications' usage by customers depends on various factors, including ease of use, security, rewards & risk, [23]. Another study confirms that customer expectations, security, privacy, infrastructure, competent employees, competition, regulation,

Table. 1 The components of digital banking transformation

Components	Description	Academic articles
Customer centric	Customer satisfaction with digital banking transformation as the services are available 24/7, Factors influencing the adoption of mobile banking include perceived usefulness, perceived ease of use and social influence opinions of friends/relatives. Additionally, the use of mobile banking applications is built on trust and quality service, which adds value to users and encourages recommendations to others	[19] [20] [21] [22]
Human resources employees relation	Employees hold positive beliefs toward digital transformation; however, additional training is required for acquiring skills and information, especially for handling customers and converting them to e-channels. Digital banking transformation impacts internal processes of human resource management (HR), providing opportunities for banks to adopt strategies such as remote work and online training, contributing to organizational sustainable performance. It influences productivity, institutional performance, and profitability while ensuring continuous learning for staff	[23] [24] [25] [26]
Customer experience	Ease of use and useful advantages are significant for maintaining customers' trust in e-channels. The role of bank branches is to convert bank customers to e-channels by referring customers and educating them, which shows a positive significant impact towards digital banking transformation. The impact of digital banking can be measured via social media or ranking the services, with transactions being processed immediately	[27] [28]
Regulatory compliance	Government support is crucial for placing policies and determining the implementation and improvement of ICT. Regulatory requirements can be met by implementing Fintech into banking systems for disclosure, reporting, and supervision. International standards regarding compliance, credit, and operational risk standards can be adhered to through the digitization process, facilitating easy exchange of information and updates. This may reduce corruption as more governance standards are automated, limiting the shadow economy	[29] [30] [31] [32]
Process automation	FinTech offers financial solutions for operational transactions, credit, and finance, providing predictability in processes and acting by offering innovative products. However, customer readiness and awareness play a crucial role in adopting financial technology	[33]

(continued)

Table. 1 (continued)

Components	Description	Academic articles
Artificial intelligence	Chatbots are responsive to customer inquiries, complaints, and follow-ups, replacing the traditional contact center. However, they may offer less support to clients, especially in countries with multiple languages and accents, with the possibility of improvement through machine learning. Artificial intelligence plays a pivotal role in mobile banking applications for service delivery and data security. However, metaverse financial services do not show positive support for digital banking, and the Internet of Things is considered a future pillar of AI. Cryptocurrency has become conventional in financial systems as part of digital transformation, leading to extensive settlement of payments. The blockchain component and banking business are involved in payments and settlements	[34] [35] [36] [37]
Innovation products & services	The adoption of digital banking transformation (DTS) has a significant relationship with green finance and environmental sustainability. SME adoption of digitalization may create synergy with banks offering digital services, utilizing bank products and services. ERP systems support the role of third-party logistics for guaranteeing credit, payments, and indirectly linked accounting functions such as reconciliation statements and fund transfers	[38] [39] [40] [41] [42]

financial resources, trust, top management support, and government support all influence digital banking adoption [44]. There is a coefficient relationship between financial technology and education as a social characteristic; whenever the education level increases, Fintech adoption becomes higher and implementation becomes easier [45]. It is not surprising that customer segments, such as patients, prefer digital banking services, with features such as ease of use, facilitation conditions, and personalization being particularly attractive [46].

The exchanges between strategy and dynamic capabilities do not always lead to highly successful digital transformation, while synergy determines market direction to achieve competitive advantage [47]. Digital banking transformation, towards competitive advantage, is focused on customer satisfaction as central by providing unique products and services [48]. Mobile banking applications represent the bank interface system, and the importance of factors affecting customer usage of mobile apps differs among societies. Risk and trust are positive towards perceiving, while social factors, ease of use, and usefulness are not significant towards acceptance of mobile banking apps [49]. All banks adopting digital transformation must ensure the maintenance of existing customers through factors influencing the acceptance of digital services, with concerns about privacy, cybersecurity & fraud [35]. For

any corporations adopting digital transformation, the focus should be on three components: competencies, learning, and capabilities [50].

The indicators of digital banking transformation show that financial technology does not employ significant business banking functions due to the resistance of people performing transactions using mobile apps, preferring face-to-face connections [51]. Key factors affecting digital banking transformation include customer perception, usefulness, bank willingness, and capabilities based on the future of automation and technology change strategy [52]. Exploring the strategy of digital banking involves analyzing the landscape of customer perception, how rivals are acting, selecting service providers, and customer segmentation, then starting building blocks of transformation of the process, including basic transactions such as account services, account balances, account statements, The exchange between traditional banking and digitalization for customers relies on promoting digital services, which is very important by expanding customer awareness of the benefits and wide range of electronic channels available 24/7 [53].

Digital banking transformation is useful tool in repetitive decision-making as management reviews and analyzes the effects of the use of digital technologies on bank net sales and revenues [54]. Developed strategies by adopting investment in information technology impact banks performance in two sides of financing, learning, and growth, which add value to organizations [55]. Banks adopting DTS will be more agile based on management decisions and may become more reliant for any events and business continuity. DTS influences productivity performance, profitability; however, the readiness of staff for this change is crucial [56]. Post-COVID-19 pandemic, the importance of digital banking is more significant, especially in uncertain conditions and became a main part of banks' strategies [57]. The strategy of developing a new business model through reviewing the current process and designing a new customer journey creates operational efficiency, adding value to achieve competitive advantage [58, 59].

6 Discussion

Upon revisiting the research questions, it is evident that digital banking transformation encompasses various systems and applications supporting banking operations, requiring infrastructure, legal considerations, and the disruption of norms. By revisiting the entire process and converting it using management information systems, accessibility and compatibility can be ensured as part of a comprehensive management strategy. This involves enhancing e-channels and digital services. Gaps related to previous studies include internal resource and capability limitations, as well as issues with external resource outsourcing from service providers, particularly concerning sensitivity information and privacy data sharing in the cloud. Clear strategic decisions are needed regarding product differentiation versus cost reduction, considering the high investment amount and rapid technological changes. A combination of strategies may be necessary to achieve a competitive advantage.

Based on the retrieved studies, customer preferences emerge as the focal point, emphasizing the experience in using digital services through platforms familiar to end-users. Mobile apps are identified as a top priority for normal customers, influencing their primary judgment about digital banking. Various definitions of digital mobility exist across studies, all pointing towards institutional strategy and business model development through investments in technology and software. This enables financial institutions to provide innovative services and gain a strong competitive advantage at reduced costs.

Digital banking have the potential to increase investment and promote financial inclusion, which reflects in economic growth and stability. Dynamic capabilities are employed to compete in the financial services industry, especially amidst the evolution of the internet and technology. The adoption of a digitalization framework by management as a strategy for the future in the banking industry involves embracing new business models tied with quality and governance, leading banks to success. However, customer intention to use digital services remains a primary factor influencing acceptance, necessitating caution due to increasing cybersecurity risks and fraud. Future models such as the Internet of Things, blockchain, and artificial intelligence leverage businesses and enhance the private sector's transformation as part of the digital economy. Regulatory bodies play a crucial role in fostering these activities.

7 Conclusion

In conclusion, the systematic review of digital transformation reveals fundamental changes and redefined business processes leading to the creation of new business models. This transformation necessitates the adoption of model standards and the redesign of information technology architecture to capitalize on innovative technologies and address challenges posed by traditional banking norms.

Further analysis to highlights internal factors influencing digital banking adoption by banks, including technological infrastructure, investment in technology, and the development of digital banking applications and services. External factors such as economic conditions, competition between banks, and government regulations also play significant roles. However, the customer remains central to both internal and external factors, with awareness, cultural knowledge, and the advantages of digital banking services being crucial for quality service provision.

Moreover, digital banking transformation involves two key functions: digital data entry and process digitization. Success in this transformation requires a focus on understanding and mapping digital behavior and customer expectations. This understanding must align with the vision of how digital initiatives can achieve competitive advantages, often through partnerships with Fintech companies. Additionally, the cost benefits of investing in banking digitization should be carefully considered to ensure effective implementation.

In summary, embracing digital banking transformation involves a holistic approach that encompasses technological advancements, customer-centric strategies,

and effective partnerships to drive innovation and competitiveness in the banking industry.

8 Limitation and Implications

Banks must incorporate digital transformation strategies into their operations and ensure that factors influencing the adoption of digital transformation are adequately addressed. According to data retrieved from Statista, investment spending on digital transformation technologies and services worldwide is projected to increase from $0.96 trillion USD in 2017 to $3.4 trillion USD in 2026 [60]. This significant increase underscores the importance of digital banking as a strategic imperative from a management perspective.

However, this study has limitations, primarily stemming from the use of the Web of Science database. While it provides a comprehensive source of academic literature, it may not capture all relevant studies on digital banking transformation. Additionally, the implications of this study are twofold. From an academic perspective, it adds value by creating existing literature on digital banking transformation. This provides a consolidated source of information for researchers and scholars interested in this field. From a business leadership perspective, the study offers ready results from accredited journals, aiding decision-makers in understanding the factors and strategies influencing digital banking transformation.

In conclusion, while this study contributes valuable insights into digital banking transformation, further research may be needed to explore additional factors and strategies that could impact the adoption and success of digital transformation initiatives in the banking sector.

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The Impact of Individual's Characteristics and Access to the Telecommunication Infrastructure on Digital Financial Inclusion



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Abstract I investigate the impact of individual characteristics and access to telecommunication infrastructure on digital financial inclusion in Palestine. I employ the probit estimation model on the 2021 World Bank global Findex database to analyze the association between individual characteristics and access to telecommunication infrastructure with digital financial inclusion indicators. The results indicate that the status of digital financial inclusion is low, but according to the percentages of access to telecommunication infrastructure, status can be improved. Furthermore, the indicators of digital financial inclusion in Palestine are negatively affected by being female, less educated, poorer, and not working. On the contrary, they are positively influenced by better access to the telecommunications infrastructure. Policymakers measures should be focused on digital financial literacy, and financial institutions should understand the financial behavior of beneficiaries and develop digital financial services that are appropriate to different individual characteristics' needs and preferences at an affordable cost.

Keywords Digital financial inclusion · Digital financial services · Individual characteristics

1 Introduction

The process by which the formal financial system is accessible, available, and utilized by all members of an economy is referred to as financial inclusion [1].

The term "financial inclusion" has become significantly important since the early 2000s [2], as many studies have been proved the significance of financial inclusion for the economic growth, employment and the reduction of poverty rates [3].

According to the acceleration of technological advancement around the world and the opportunity of using technology to facilitate our daily life processes, attention

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has shifted toward employing technology to achieve higher percentage of financial inclusion.

In Palestine, a mere 38.5% of those aged fifteen and above possess a formal financial institution account, a mobile money account, or both. Mobile phone ownership stands at 85.9%, while internet access is available to 75.6% of the population.[1] The data presented indicates that while the proportion of individuals in Palestine with bank accounts is relatively low, the substantial number of individuals with mobile phones and internet access provides financial institutions with a substantial opportunity to expand their service offerings through digital channels.

Therefore, it is important to take advantages of the telecommunication infrastructure, and employing financial technology to accomplish financial inclusion process in Palestine. Particularly, as it is considered a special case due to its political circumstances with Israel occupation and checkpoints distributed among the cities [4]. One of the biggest problems that financial institutions encountered in Palestine to provide financial services are checkpoints and the restriction imposed on Area C. This issue led to an attempt to implement digital financial inclusion to enable marginalized individuals in Area C and Gaza strip to be able to get access to and usage of financial services [5].

Digital financial inclusion is defined as "the digital access to and use of formal financial services by excluded and underserved populations." These services should be suitable to the beneficiaries' needs and provided at affordable cost for both the beneficiary and the service provider [6].

Given the political situation in Palestine and the recent development of digital financial services provided by financial institutions, which is authorized and encouraged by Palestinian Monetary Authority (PMA), I will use the World Bank's Global Findex database to in this paper to assess the determinant of digital financial inclusion in Palestine.

My contribution is to bridge the data gap by utilizing latest World Bank global Findex database using the recently added indicators that is related to access to and usage of digital financial services.

Following this structure, I conducted the remainder of this study: Peruse the pertinent literature on digital financial inclusion and financial inclusion in the "Literature Review" section. Data, variables, models, and methodologies are detailed in the "Methods" section. To present and analyse the empirical findings, refer to the "Results and Discussion" section. The study will be concluded in the "Conclusions" section.

2 Literature Review

Financial inclusion is characterized as steady, affordable, and convenient access to a variety of financial services [7].

[1] Author's calculation relied on data from World Bank Global Findex database 2021.

The significant focus devoted to financial inclusion can be attributed, in part, to the numerous studies that demonstrate its direct correlation with poverty alleviation [8–13].

The Alliance for Financial Inclusion (AFI) provides a summary of the financial inclusion dimensions of access, usage, and quality [14] in order to quantify financial inclusion. On the contrary, numerous researchers employ the aforementioned dimensions—namely, account ownership in a formal financial institution, borrowing and saving in a formal financial institution within the previous 12 months as primary indicators of financial inclusion [15–17]. Additionally, examine the level of financial inclusion in specific countries within the region and analyze the relationship between financial inclusion dimensions and individual characteristics.

A comparative analysis of the degree of financial inclusion in China and other BRICS nations revealed that China has a notably high level of financial inclusion. Additionally, the study revealed that men who tend to possess higher levels of education, and the advanced age are correlated with increased utilisation of formal accounts and credit [15].

The financial inclusion of individuals residing in Afghanistan, Pakistan, the Middle East, and North Africa was examined in a comparable study. Being poor and female decreases the likelihood of being included in financial system, whereas education level enhances financial inclusion, according to the findings [16].

Exclusion in Egypt is associated with a lack of confidence in financial institutions, low income, low education, and advanced age, according to another study [18].

The correlation between individual attributes and the impact of Islamic banking in MENA nations of varying degrees of development was examined in a recent study. Its findings revealed that being male, wealthy, and older positively affects financial inclusion in MENA. In addition, Islamic banking plays a significant role in promoting financial inclusion, particularly among those who are deeply devoted to their religious convictions [17].

An investigation illustrated this point by establishing a correlation between financial inclusion and personal attributes including but not limited to youth, affluence, enhanced educational attainment and employment prospects, urban residency, and a more conducive environment for accessing financial services. Innovation in technology, business models, and channels of service delivery can therefore contribute to the enhancement of financial inclusion [19].

The impact of socioeconomic and demographic variables on the adoption of online banking in Germany was investigated in a separate study. The likelihood of utilising an online bank account increases with age, education, and income, according to the study's findings. In addition, it was discovered that internet and financial literacy as well as population size positively influence the utilisation of online bank accounts [20].

Males with higher levels of education, age, income, and employment status are more likely to adopt digital financial services, according to a similar study. Additionally, the study revealed that mobile money adoption is greater among individuals with advanced degrees and a propensity for conducting online transactions. There is

a greater likelihood that affluent males will be engaged in the utilisation of digital financial services [21].

Others, on the other hand, sought to determine the extent to which the adoption of technology by government authorities in the Middle East and North Africa contributes to the expansion of financial inclusion and the provision of digital payment processes to a variety of individuals. Their research confirmed that the government's cashless policy has a significant impact on the advancement of financial inclusion [22].

Financial inclusion has garnered considerable attention in the literature review, primarily because of its substantial influence on poverty alleviation and economic expansion. Furthermore, scholars have transitioned their focus from conventional to digital financial inclusion due to the latter's potential to engage a more extensive demographic.

3 Methods

3.1 Data

The information used in this study pertains to one thousand adults residing in Palestine and was extracted from the World Bank Global Findex Database 2021 edition. During the COVID-19 pandemic, this edition contains results from representative surveys of approximately 128,000 adults in 123 economies. The survey comprises inquiries pertaining to various aspects of personal characteristics, internet access, mobile money accounts, internet banking, internet access and usage indicators for digital financial inclusion, and mobile phone ownership [23].

3.2 Variables

I have benefited from the study variable of [24] that provide valuable perspectives on the usage of financial technology in our life. I added an independent variable "has an account", that is considered the main key to be financially included (Table 1). The table includes the explanatory and dependent variables of the study, their definitions, and descriptive statistics.

The table shows that only 38.5% of Palestinian individuals older than the age of fifteen have an account at a formal financial institution or mobile money account or both of them, 85.9% owns a mobile phone, and 75.6% has internet access, 33.5% of individuals use mobile or internet to check account balance, and 15.2% use internet to buy something on line. These statistics demonstrates that although the percentages of owning a mobile phone and internet access are high in Palestine, the indicators of digital financial inclusion are bad.

Table 1 Main variables in the estimation

Variables	Obs.	Mean	St. dev.
Explanatory variables			
Female	1000	0.565	0.496
Age	1000	38.066	17.044
Age2	1000	1739.232	1521.674
Income_poorest 20%	1000	0.185	0.388
Income_second 20%	1000	0.186	0.389
Income_third 20%	1000	0.19	0.392
Income_fourth 20%	1000	0.202	0.402
Income_richest 20%	1000	0.237	0.425
Primary education	1000	0.221	0.415
Secondary education	1000	0.59	0.492
Tertiary education	1000	0.189	0.392
Work force participation	1000	0.441	0.497
location	1000	0.095	0.293
Access to telecommunication infrastructure			
• Owns a mobile phone	1000	0.859	0.348
• Internet access	1000	0.756	0.430
Dependent variables			
Account	1000	0.385	0.487
Access dimension sub indicators			
• Used mobile phone or internet to access financial institution account	346	0.116	0.320
• Mobile phone or internet to check account balance	346	0.335	0.473
Usage dimension sub indicators			
• Use mobile phone to pay for a purchase in-store	1000	0.076	0.265
• Made bill payments online using the Internet	1000	0.035	0.184
• Bought something online using the Internet	1000	0.152	0.359

Source Author's own calculations. Data obtained from World Bank 2021 Global Findex database

3.3 Model and Methodology

The main objective of the paper is to understand how individual characteristics of 1000 Palestinian adults and their access to telecommunication infrastructure affect digital financial inclusion in Palestine. In this paper, I use a probit estimation to explain the measures of access and usage of financial technology as indicators for digital financial inclusion and applied the model that was used by [24]:

$$\begin{aligned} \text{DFI} = \alpha + \beta_1 * \text{gender}_i + B_2 * \text{education}_i + B_3 * \text{age}_i + B_4 * \text{income}_i \\ + B_5 * \text{location}_i + B_6 * \text{workforce}_i + B_7 * \text{owning a mobile}_i \\ + B_8 * \text{internet access} + \varepsilon_i \end{aligned} \quad (1)$$

where DFI is a binary variable, and denotes one of the following each time:

1. Has an account.
2. Access dimension:
   A. "Used mobile phone or internet to access financial."
   B. "Mobile phone or internet to check account balance."
3. Usage dimension:
   A. "Used mobile phone to pay for a purchase in-store."
   B. "Made bill payments online using the Internet."
   C. "Bought something online using the Internet."

I added "has an account" as dependent variable because it's the main key of financial inclusion.

The explanatory variables (gender, income, education, workforce, location, owning a mobile, access to internet) are dummy variables. (age) is number of years, and (age2) is squared age to consider possible nonlinearity in the relation between age and digital financial inclusion.

4 Empirical Result and Discussion

The marginal effects for the probit estimation are displayed in Table 2. The dependent variables utilised in this analysis are the "has an account," "access dimension," and "usage dimension."

The findings presented in Table 2 indicate that there is a negative correlation between being female and possessing a financial institution account, a mobile money account, or both, as well as checking the account balance via mobile phone or the internet within the previous year (access). However, there is a positive correlation between being female and making an online purchase via mobile phone or the internet within the past year (usage). In the context of the negative relationship between owning a formal traditional account and being female is in line with the results of [15–18], and with result of [21] regarding the negative relationship with mobile money in order to make online transaction and with [24] regarding accessing digital financial services.

The results also show a positive relationship between age and "has an account" which mean that as individual get older he/she will be more likely to have an account, but until certain age because the sign of age2 is negative. And this is the case for the effect of age2 on checking the account balance using mobile phone or internet (access) although the effect of age is not significant. The findings is consistent with the findings of [15–18, 22, 24].

Table 2 Determinants of digital financial inclusion (has an account, access and usage determinants) in Palestine: the marginal effects for the probit estimation

	Has an account	Access dimension		Usage dimension		
		Used mobile phone or internet to access financial institution account	Mobile phone or internet to check account balance	Use mobile phone to pay for a purchase in e-store	bill payments online using the Internet	Bought something online using the Internet
Female	− 0.178***	0.001	− 0.172***	0.021	− 0.008	0.062***
Age	0.031***	− 0.010	0.017227	− 0.00001	− 0.0003	− 0.0009
Age2	− 0.0002***	0.0001	− 0.0002*	− 0.00001	0.000007	− 0.00002
Income_ poorest 20%	− 0.463***	− 0.015	− 0.404**	− 0.100***	− 0.015	− 0.192***
Income_ second 20%	− 0.303***	− 0.029	− 0.111	− 0.066***	− 0.020*	− 0.091***
Income_third 20%	− 0.166***	0.005	− 0.180**	− 0.021	− 0.012	− 0.058**
Income_ fourth 20%	− 0.159***	− 0.033	− 0.047	− 0.034**	− 0.002	− 0.047*
Primary education	− 0.244***	− 0.124**	− 0.151*	− 0.044**	− 0.026**	− 0.065**
Secondary education	− 0.146***	− 0.051	− 0.133**	− 0.015	− 0.008	− 0.026
Workforce participation	0.132***	0.039	0.052	0.033**	0.013**	0.044**
Location (1 = rural)	− 0.062	0.034	− 0.064	− 0.013	− 0.014	− 0.026
Access to telecommunication infrastructure						
Owns a mobile phone	0.110*	− 0.028	− 0.266	0.064*	− 0.0005	0.075*
Internet access	− 0.013	0.168**	0.302***	0.019	0.018*	0.119***
Observations	1000	346	346	1000	1000	1000
Pseudo R^2	0.207	0.086	0.136	0.153	0.247	0.157
Log likelihood	− 528.523	− 113.200	− 190.590	-227.890	− 114.262	− 359.363
Predicted probability (at mean values)	0.353	0.073	0.190	0.038	0.007	0.092

Note Estimated marginal effects without stars are statistically insignificant
p-Value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source Authors' calculations

Concerning the income level, I find that the effect of income level on having an account, access and usage in general is become negative as the level of income decreases. The result of having an account in formal institution is also along with results of [15–18], while it is related to findings of [20–22, 24] regarding digital financial services.

Similarly, the lower the level of education is the less likely that individual has an account, and get access to financial technology for digital services [25, 26]. However, the usage is only significant and negatively affected by primary education. That's mean, the individual who has completed primary education or lower, is less likely to have an account, access or usage of phone or internet to benefit from digital financial services. Again the findings of my paper support those of [15, 16, 18, 20–22, 24].

Employment increases the probability of possessing a bank account, utilizing a mobile device to make in-store purchases, paying bills, and conducting online purchases via the Internet. This bring into line with [21] who found that the individual who in workforce is more likely to adopt digital financial services.

A negative but insignificant correlation is observed between location (rural) and the utilization of financial technology for bill payment, online or e-store shopping, checking account balances via mobile phone or the internet, and paying accounts.

Lastly, possessing a mobile phone and having access to telecommunication infrastructure increase the likelihood of opening a mobile money account or a financial institution account, which can subsequently be utilized to make online purchases or pay for e-commerce transactions [27]. Therefore, possessing a mobile phone may be regarded as an initial stride towards achieving digital financial inclusion. Moreover, internet connectivity enhances the likelihood of accessing and utilizing digital financial services.

5 Conclusion

This study examines the influence of personal attributes and telecommunication infrastructure accessibility on various aspects of digital financial inclusion. The research sample comprises one thousand Palestinian citizens. By utilizing the World Bank's global Findex database and the recently added indicators, I attempted to fill in the data gap regarding Palestine. The indicators I utilized are from the 2021 edition, which pertains to the utilization and accessibility of digital financial services.

In terms of account ownership, access to digital financial services, and usage thereof, Palestine has a low level of traditional and digital financial inclusion, according to a descriptive statistical analysis of World Bank global Findex data. However, this also suggests a significant potential for improving digital financial inclusion, given the substantial proportion of individuals who possess mobile phones and internet connectivity.

An examination of the relationship between access to telecommunication infrastructure and individual characteristics and digital financial inclusion reveals the following:

Possession of a mobile phone, employment, male gender, higher education, greater wealth, and advanced age all contribute to an increased likelihood of possessing a formal financial institution account or a mobile money account, which serves as an initial milestone towards achieving financial inclusion.

Additionally, there is a positive correlation between higher education, being male, older, and wealthier, and having internet access. This correlation enhances the ability to utilize digital financial services through mobile phones or the internet, such as checking account balances or accessing financial institution accounts.

However, there is a positive correlation between being female, having a higher income, being employed, and having internet access with the likelihood of utilizing digital financial services. This includes activities such as making bill payments via mobile phone, purchasing items in an e-store, and conducting online shopping. Furthermore, those with a primary education or less are less likely to possess, utilize, have access to, or maintain an account for digital financial services, according to the findings.

Owning a mobile phone and having internet connectivity boosts the chances of having an account, which is a crucial step in promoting digital financial inclusion. This enables access to use of digital financial services. However, the extent of digital financial inclusion depends on individual characteristics.

Policymakers must carefully consider specific measure to boost digital financial literacy. As providers of digital financial services, institutions should understand each beneficiary's unique financial behavior and design cost-effective services tailored to their needs and preferences.

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Examining the Determinants of Postgraduate Students' Behavioral Intentions in Utilizing MOOCs for Advanced Learning



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Abstract This study aims to investigate the factors influencing postgraduate students toward using Massive Open Online Courses (MOOCs) for advanced learning. A research model is proposed to examine the use of learning techniques during times of risk and whether MOOCs can facilitate lifelong learning outside of the classroom. The model includes four constructs: perceived usefulness, perceived benefit, perceived ease of use, and perceived risk, to measure the usage behavior of postgraduate students in utilizing MOOCs as a learning tool. By exploring the predictors of utilizing MOOCs among postgraduate students', this study is expected to enrich the literature in the open education and personalized learning areas. In addition, the proposed model will provide insights into how MOOCs can support postgraduate students in their learning endeavors.

Keywords MOOCs · Risk management · TAM · Perceived benefit · Perceived risk · Usage behavior

1 Introduction

MOOCs refers to a combination of information and communications technology and educational programs. MOOCs have emerged as a means of offering global communication and education opportunities to both urban and rural societies, using Internet services [1]. In 2012, MOOCs were developed as part of e-learning, with the goal of providing widespread access to education [2]. Applications such as Future Learn, Udacity, XuetangX, edX, and Coursera have enabled learners to support their

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academic pursuits by offering small online courses at a low cost or even for free, often in collaboration with high-ranking universities [3].

Recently, MOOCs provided a significant influence in the field of education and learning [4]. With self-development now valued more than diplomas and degrees, and universities seeking to attract less-costly learners, MOOCs have emerged as a means to meet these needs [5]. These portals offer online lectures by some of the world's best educators and are widely accessible through the internet at any time and place. According to recent data, there are currently 11,400 MOOCs available to support millions of learners [6]. This paper aims to design a research model to investigate whether postgraduate students are utilizing the proper tools, methods, and learning models to become creative and independent learners during risks. Additionally, the study seeks to determine if MOOCs help postgraduate students engage in lifelong learning beyond the classroom.

Online education has gained tremendous popularity in recent years, with massive open online courses being a prominent form of online learning. The COVID-19 pandemic further accelerated the adoption of online education, as higher education institutions had to transition to remote learning. Despite the growing popularity of online education, there is still limited research on the determinants of postgraduate students' behavioral intentions in utilizing MOOCs for advanced learning. However, several studies have explored factors influencing students' perception and adoption of online learning in general [7, 29]. Given the limited research on postgraduate students' behavioral intentions in utilizing MOOCs for advanced learning, it is vital to explore the specific determinants that influence their decision to engage with MOOCs.

2 Theoretical Background

2.1 Massive Open Online Courses (MOOCs)

MOOCs are a form of distance learning that allows students to interact and access learning contents over the internet. MOOCs provide a wide range of courses, taught by instructors from universities and institutions. MOOCs typically offer course materials such as video lectures, readings, and assessments, and are often free or available at a low cost. MOOCs aimed to be accessible to a broad range of learners, with no prerequisite knowledge or qualifications required. One of the defining features of MOOCs is their scalability—they can accommodate tens of thousands of students. Several MOOC platforms like Coursera, edX, and Future Learn are considered as one of the most used platforms of MOOCs that offer courses in different fields. In the last few years, the popularity of MOOCs has increased due to their accessibility and affordability features and making high-quality education available to anyone with an internet connection. They are also useful for professionals looking to expand

their skills and knowledge without having to take time off from work or enroll in a traditional degree program.

2.2 TAM Model

Perceived ease of use and perceived usefulness are the main constructs of Technology Acceptance Model that mostly utilized to examine the adoption of different technology [7, 8]. Perceived usefulness refers to the extent to which a user thought that using a technology will enhance their performance when adopting a technology [9]. The perceived user-friendliness is also crucial to measure the acceptance and usage through its mediating role in perceived usefulness [10]. However, MOOCs users are not solely motivated by utility and value other factors beyond usefulness and ease of use [5]. Perceived ease of use refers to the degree to which a person believes that using a technology is effortless [11]. To enhance the learning process of users, easy-to-use and usable MOOCs must be provided [12]. Moreover, it is important to consider perceived ease of use to achieve a function, but it is not sufficient to evaluate usefulness alone [13]. In addition, [14] discovered that perceived ease of use did not have a direct significant influence on actual program usage and that its utility determines its usage.

2.3 Perceived Benefits

According to [15], gender is a specific factor that influences intention-fulfillment, along with the value of MOOC benefits. In addition, [16] discovered that self-regulated learning, the quantity of short exams accessed, participation duration, and perceived usability are key predictors of intention-fulfillment. [17] reported that participants' previous experience with MOOCs platforms and the significant they assigned to the benefits of MOOCs indirectly affect their intention-fulfillment indirectly by influencing both the number of short exams accessed and perceived usefulness of the course. [18] also found that participants who set goals for their online learning and understood the advantages of taking the MOOCs were more inclined to report higher level of contentment with the course.

2.4 Usage Behavior

The initial wave of MOOC research revealed different populations of students in terms of location, ethnicity, and engagement in course [19]. MOOCs attract many learners from different backgrounds and motivations, resulting in varying levels of engagement with the course [20, 21]. The diversity of participants, their attitudes, and

motivations has made MOOCs an ideal platform for investigating gaps in teaching and learning [22]. Additionally, older, and more experienced learners have demonstrated a greater understanding and utilization of effective learning strategies [23]. MOOCs and other types of open online education offer participants the opportunity to select their preferred learning behavior in terms of direction and schedule [24].

2.5 Perceived Risk

Perceived risk is a multifaceted construct often related to users' concerns when adopting a new technology, such as MOOCs. It encompasses several dimensions, including but not limited to financial, performance, social, psychological, and time risks. In the context of MOOCs, perceived risk can affect a learner's decision to enroll, participate, and complete a course [25, 26]. The literature highlights the importance of considering various perceptions of risk when adopting technological innovations [27]. Although personalized learning approach has some obstacles, exposing differences in group attitudes, behaviors, and motivations may be a step towards achieving it [28–31]. MOOC learners come from diverse backgrounds and experiences, and variations in their learning strategies and satisfaction have been observed, depending on factors such as age and academic performance [14, 22]. Therefore, learning techniques and analytics can use utilized such variables as input to expect at-risk students, recommend appropriate learning paths, or provide targeted support [19, 21].

Moreover, time investment, data privacy, relevance of content, and return of effort are factors that can be utilized to evaluate the potential risks toward using MOOCs. If students perceive the risk level to increase, their response or usage behavior might be affected through several ways like decreased engagement, lowered motivation, preference for traditional learning, demands for better support, and selective usage where some students may become more selective in the MOOCs they choose to pursue, favoring courses from reputable institutions or those with higher peer ratings, to minimize perceived risks [26].

3 Conclusion

This study proposed a model to investigate whether postgraduate students use various learning techniques during risky situations, as shown in Fig. 1. The goal is to determine if MOOCs can assist postgraduate students in becoming independent and innovative learners, while also enabling them to learn beyond the traditional classroom environment. The research model comprises four constructs, which assess students' usage behavior, including perceived usefulness, TAM model constructs and perceived risk. MOOCs provide a useful platform for postgraduate students, with appropriate tools, methods, and learning models during times of uncertainty. By utilizing MOOCs, students can become creative and independent learners, while

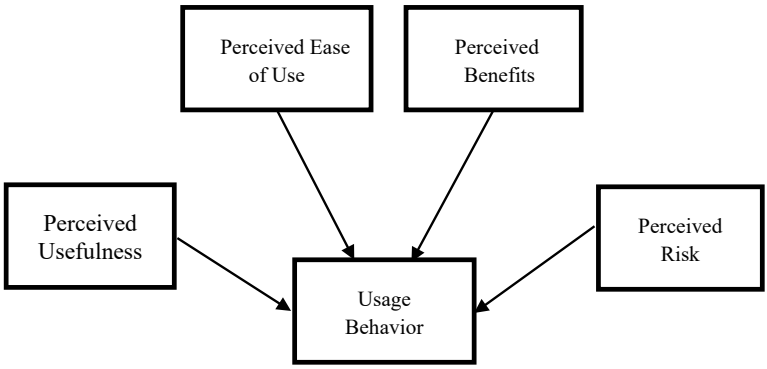


Fig. 1 The proposed model

also overcoming educational obstacles. Moreover, it can be concluded that MOOCs have a potential role in enhancing risk management strategies among postgraduate students. Perceived risk is an important factor that affects the acceptance and usage of MOOCs among learners.

MOOCs offer a diverse range of learning experiences, catering to learners' different backgrounds and motivations. The availability of personalized learning paths and support through learning analytics algorithms can help in identifying at-risk students and providing timely interventions. Furthermore, MOOCs can be used to develop specific risk management skills and competencies among postgraduate students, preparing them for real-world situations [28, 29]. Therefore, the integration of MOOCs in postgraduate education can contribute to the development of effective risk management strategies among learners.

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The Impact of Marketing Mix Elements on the Purchase Decision: Flower Consumers as a Case Study



Iyad A. A. Khanfar and Osama Muhammad Ibrahim

Abstract This chapter seeks to investigate the influence of various marketing mix elements on the purchasing decisions made by flower consumers in Amman, Jordan. The research encompassed and independent variable, the marketing mix, represented by its four dimensions, namely product, price, promotion, and distribution. The dependent variable focused on the purchase decision of flower consumers. To collect the necessary data, a descriptive-analytical method was employed, utilizing a questionnaire as the primary tool. A random sample of 420 flower consumers in Amman, Jordan, was selected, and subsequent analysis was conducted on 400 valid questionnaires using appropriate statistical techniques with the aid of SPSS software. The findings of the study highlight that the mean scores for the marketing mix elements were generally high, with the product element receiving the highest score, followed by price and distribution. Conversely, the promotion element received the lowest score. Moreover, the study reveals a statistically significant positive impact of the marketing mix elements (product, promotion, price, distribution) on the purchase decision of flower consumers in Amman, Jordan. Based on these findings, the study recommends the continuation and improvement of the current distribution policy implemented by flower sellers, while also emphasizing the need for continuous development to adapt to market fluctuations. Additionally, the study suggests the intensification of promotional campaigns for flowers across various advertising channels to enhance consumer awareness regarding their significance and quality.

Keywords Marketing mix elements · Purchase decision · Consumers · Flower consumers · Amman · Jordan

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1 Introduction

In order to address challenges, competition, and maintain long-term viability in the market, organizations must prioritize marketing. It involves using a wide variety of strategies and methods to understand what consumers need and want, and ultimately ensure their satisfaction and approval.

The marketing mix is known as a set of tools adopted by individuals, with the end goal of evoking a response desired by the target market. This concoction consists of four main ingredients: product, price, promotion, and distribution (Isoraite 2018). The consumer's decision-making process is swayed by a myriad of factors that weave together their choices at the point of purchase. These factors are like pieces in a puzzle, personal, demographic, psychological, social, and cultural elements, all playing a part. Among these factors is the marketing mix which is considered an effective toolin accomplishing a competitive advantage and fostering customer loyalty [11].

The analysis of consumer selections is critical to crafting effective marketing strategies. It helps unveil consumer needs, wants and consumption behavior. The study aims to grasp how different elements of the marketing mix impact the buying actions of cultivated flowers consumers in Amman [4].

1.1 Problem Statement and Research Questions

Marketing in today's world seeks everlasting relationships with customers where if pleased, they will show loyalty by coming back and recommending others to the establishment. The marketing mix is a set of controllable tools that can be used to produce the response desired from the target market. Marketing has significant effects on consumer purchases as pointed out by past studies like the one done by Khalifa and Al-Agha [9] showing that promotional ads have an impact on shoppers' decisions towards products in Kurdistan Region.

The success of cultivated flowers production projects holds significant potential by the application of marketing mix components. Consequently, the aim of this chapter is to thoroughly investigate and assess the influence exerted by the elements of the marketing mix on the purchasing choices made by consumers of cultivated flowers in the urban center of Amman. By doing so, it is anticipated that this research will contribute to the enhancement of marketing strategies and the subsequent augmentation of demand for these products within the local market.

The primary inquiry examined in this study pertains to the influence of the marketing mix components on the purchasing behavior of cultivated flowers consumers residing in the urban locale of Amman.

1.2 Hypotheses

Based on the problem statement and objectives of the study, the following hypotheses were formulated:

- **Main Hypothesis (H0)**: "There is no statistically significant effect at the significance level (0.05α ≤) for the marketing mix elements on the purchasing decisions of cultivated flowers consumers in the city of Amman."

From the main hypothesis, the following sub-hypotheses are derived:

- **H01**: "There is no statistically significant effect at the significance level (0.05α ≤) for the product element on the purchasing decisions of cultivated flowers consumers in the city of Amman."
- **H02**: "There is no statistically significant effect at the significance level (0.05α ≤) for the price element on the purchasing decisions of cultivated flowers consumers in the city of Amman."
- **H03**: "There is no statistically significant effect at the significance level (0.05α ≤) for the promotion element on the purchasing decisions of cultivated flowers consumers in the city of Amman."
- **H04**: "There is no statistically significant effect at the significance level (0.05α ≤) for the distribution element on the purchasing decisions of cultivated flowers consumers in the city of Amman."

2 Previous Studies

Abu Samra [1] conducted a study that revealed a noteworthy impact of various components of the green marketing mix on the purchasing choices of consumers of electric cars in Amman, with the exception of the distribution element. This study also identified significant variations in the effects based on demographic factors such as gender, age group, and monthly income.

Hussein [7] conducted a study that revealed a statistically significant impact of social factors and marketing mix elements on the purchase intention of self-service vending machine users within the private university student population in Jordan. Conversely, Bakkar [6] found no positive correlation between flower marketing and purchasing decisions among women in Sudan. Nevertheless, a positive association was observed between brand image and peer influence in relation to purchasing intentions among women.

In a study conducted by Khunfur [10], it was observed that the pharmaceutical marketing mix elements had a significant influence on the purchasing behavior of patients who frequented pharmacies in Amman. The findings revealed a positive correlation between factors such as pharmaceutical product, price, distribution, promotion, and the decision to purchase locally manufactured drugs.

3 Study Methodology

This research was designed based on specific goals, so a descriptive analytical methodology was used. Descriptive analysis is about presenting scientific description of phenomena or scientific problems, and then providing logical interpretations that are supported by evidence and proof. Through this approach, the researchers can define frameworks to address the problem identified in a specific manner [3]. The issue at hand in this chapter is focused on uncovering the impact of marketing mix elements towards purchasing decisions made by cultivated flowers consumers in Amman. To meet this end, the researcher came up with a questionnaire design.

3.1 Study Population

The population under study includes all individuals who purchase cultivated flowers within Amman, a city situated in Jordan.

3.2 Study Sample

The sample of the study is limited to a group of people who buy cultivated flowers in the city of Amman, located in Jordan. This group consisted of a total of 400 individuals, who were carefully selected through an appropriate sampling technique from the broader study population.

3.3 The Study Instrument: Validity and Reliability of

Validity of the Questionnaire

To ascertain the face validity of the questionnaire, the researchers sought the evaluation of a panel of esteemed professors hailing from Jordanian universities. These experts were tasked with assessing the appropriateness of the questionnaire's content and the accuracy of its language.

Reliability of the Questionnaire

In order to ascertain the dependability of the scale utilized in the study, the researchers employed Cronbach's alpha test on the sample population, with the purpose of calculating the internal consistency reliability coefficient for each individual item within the scale. The values are shown in Table 1.

Table 1 Result of Cronbach's alpha test

Item	Cronbach's alpha value
Product	0.895
Price	0.870
Promotion	0.799
Distribution	0.860
Purchasing decision	0.710

Table 2 The statistical standard for interpreting the arithmetic means of estimates of individuals in the study sample for each item of the scale

Arithmetic mean	Degree of agreement
1.00–2.33	Low
2.34–3.67	Moderate
3.68–5.00	High

From Table 1, it is evident that the reliability coefficients for the study scale items ranged from (0.799–0.895), which are considered high and sufficient for conducting the study.

3.4 Statistical Standard Used in the Study

To interpret the arithmetic means of the variables' items in the study, the statistical standard shown in Table 2 was used.

Where the range of each category was calculated by dividing the difference between the largest and smallest values by the number of categories, resulting in (1–5)/3 = 1.33.

3.5 Statistical Methods Used in Data Analysis

1. **Descriptive Statistics**: It is used to describe the characteristics of the tested sample and respond to its hypotheses.
2. **Cronbach's Alpha Coefficient**: Its purpose is to demonstrate the internal consistency of the scale for both independent and dependent research variables (Consistency Reliability).
3. **Frequencies and Percentages**: It is used to demonstrate the demographic characteristics of the surveyed sample.

4. **Means and Standard Deviations**: It is used to present average responses to survey items and axes, as well as to show the degree of dispersion of responses around their average.

3.6 Description of Study Variables

- Main Question: What is the impact of the marketing mix elements on the purchasing decision of cultivated flower consumers in Amman city?

In the attempt to answer this question, the means and standard deviations of the marketing mix elements were calculated. The following Table 3 illustrates this.

Based on the data presented in the aforementioned table, it is evident that the marketing mix elements displayed a range of means from 4.187 to 4.383, indicating a substantial level of agreement among respondents. Specifically, the product element obtained the highest mean, closely followed by the price element with a mean of 4.359. Conversely, the promotion element garnered the lowest mean. Overall, the total scale mean was calculated to be 4.311.

This main question leads to the following sub-questions

- Sub-Question 1: What is the impact of the product element on the purchasing decision of cultivated flower consumers in Amman city?

In order to address this particular sub-inquiry, the statistical calculations of the means and standard deviations were conducted on the items pertaining to the product element, with a specific focus on their influence on the purchasing behavior of cultivated flower consumers within the city of Amman. The following Table 4 illustrates this.

The data presented in Table 4 reveals that the average scores for the product element items varied between 4.202 and 4.483, indicating a high level of agreement among respondents. Item (1) obtained the highest ranking, followed by "There is a variety of high-quality flowers in the market." Conversely, the item "There is information accompanying flowers about their nature and care methods" received the lowest ranking.

Table 3 Means and standard deviations of marketing mix elements ranked descendingly by means

Rank	Item no	Marketing mix element	Mean	Standard deviation	Degree of agreement
1	1	Product	4.383	0.509	High
2	2	Price	4.359	0.553	High
3	4	Distribution	4.316	0.530	High
4	3	Promotion	4.187	0.552	High
		Total scale	4.311	0.450	High

Table 4 Means and standard deviations of product element items ranked descendingly by means

Rank	Item no	Item description	Mean	Standard deviation	Degree of agreement
1	1	Attractive appearance and display method of flowers	4.483	0.596	High
2	5	There is a variety of high-quality flowers in the market	4.478	0.617	High
3	2	I like the display and arrangement of flowers	4.422	0.663	High
4	3	There is diversity in types of flowers in terms of shape, color, and size	4.370	0.655	High
5	4	There is diversity in flower marketing strategies (bunches, arrangements, packages)	4.345	0.669	High
6	6	There is information accompanying flowers about their nature and care methods	4.202	0.777	High
		Total product	4.383	0.509	High

- Sub-Question 2: What is the impact of pricing decisions on the purchasing decision of cultivated flower consumers in Amman city?

In order to address this specific sub-inquiry, calculations were performed to determine the means and standard deviations of the items within the price element, as well as their influence on the purchasing behavior of cultivated flower consumers residing in the city of Amman. The following Table 5 illustrates this.

The data presented in Table 5 reveals that the price element items exhibit a range of means, varying from 4.243 to 4.455, indicating a high level of agreement among respondents. Among these items, item 9 received the highest ranking. Item 7 ranked second. Lastly, item 11obtained the lowest ranking among the respondents.

- Sub-Question 3: What is the impact of promotional activities on the purchasing decision of cultivated flower consumers in Amman city?

In order to address this sub-inquiry, the researchers computed the means and standard deviations of the items pertaining to the promotion element, as well as their influence on the purchasing behavior of cultivated flower consumers in the city of Amman. The following Table 6 illustrates this.

Table 5 Means and standard deviations of price element items ranked descendingly by means

Rank	Item no	Item description	Mean	Standard deviation	Degree of agreement
1	9	High-quality flowers are offered in the market at reasonable prices	4.455	0.636	High
2	7	Price offers, discounts, and appropriate flower prices are provided	4.453	0.706	High
3	10	Price changes and discounts on flowers are considered	4.395	0.660	High
4	8	Competitive and diverse prices are provided for flowers in the market	4.307	0.764	High
5	12	Flowers are offered at low prices	4.302	0.716	High
6	11	Discounts are offered based on the quantity of flowers sold	4.243	0.768	High
		Total Price	4.359	0.553	High

Table 6 Means and standard deviations of promotion element items ranked descendingly by means

Rank	Item no	Item description	Mean	Standard deviation	Degree of agreement
1	13	There is credibility in the advertisements published for flowers	4.423	0.652	High
2	17	I believe that the seller's personality and method of dealing are good	4.390	0.689	High
3	14	Comprehensive information about flowers is provided	4.188	0.699	High
4	18	Flowers or free samples are provided	4.177	0.879	High
5	15	The influence element is provided in cultivated flowers ads such as color, design, or sound	4.130	0.765	High
6	16	There is repetition in cultivated flowers ads	3.815	0.956	High
		Total promotion	4.187	0.552	High

Upon examination of Table 6, it becomes apparent that the promotion element items exhibited a range of means from 3.815 to 4.423, indicating a high level of agreement among respondents. The item that garnered the highest ranking was item 13. This was closely followed by item 17. Conversely, item 16 received the lowest ranking.

- The fourth sub-question: What is the impact of distribution on the purchasing decision of flower consumers in Amman?

In order to provide an answer to this inquiry, we extracted the arithmetic means and standard deviations of the distribution element paragraphs, and evaluated their influence on the purchasing choices made by flower consumers in Amman. The following Table 7 illustrates this.

According to Table 7, the distribution element paragraphs exhibited a range of arithmetic means, from 4.128 to 4.470, indicating a significant level of agreement. Among these items, item 24 ranked the highest with an arithmetic mean of 4.457. Following closely behind was item 21. The subsequent position was held by item 22. Lastly, paragraph 20 obtained the lowest ranking.

Table 7 Arithmetic means and standard deviations of distribution element paragraphs arranged in descending order according to the arithmetic means

Rank	Item no	Item description	Arithmetic mean	Standard deviation	Degree of agreement
1	24	Flowers are delivered on time and within a short period	4.470	0.640	High
2	21	Flowers are delivered without defects	4.457	0.616	High
3	22	Appropriate methods and means are used to preserve flowers	4.348	0.642	High
4	19	I am provided with various types of flowers	4.257	0.680	High
5	23	Order tracking services for flowers are available	4.235	0.772	High
6	20	Flower products are available permanently	4.128	0.780	High
	Overall		4.316	0.530	High

4 Testing Study Hypotheses

In this section, statistical tests (simple linear regression and multiple regression analysis) were used. Here is a summary of that:

- Main Hypothesis: "There is no statistically significant effect at the significance level ($0.05\alpha \leq$) for the marketing mix elements on the purchasing decision of flower consumers in Amman."

In order to validate this hypothesis, the impact of the independent variables (marketing mix) on the purchasing decision was assessed through the utilization of a multiple linear regression analysis. Here's a presentation of that:

Testing the Significance and Interpretability of the Used Multiple Linear Regression Model.

Linear Correlation Test (Multicollinearity)

To ascertain the absence of excessive correlation among the independent variables, the variance inflation factor (VIF) and tolerance test were employed. It was imperative that the VIF values remain below 10, while the tolerance test values surpass 0.05 for every independent variable. Table 8 shows this.

Based on the findings presented in Table 8, it is evident that the Variance Inflation Factor (VIF) values for all independent variables are below 10, and the tolerance test values exceed the threshold of 0.05. These results indicate the absence of any significant correlation issues among the independent variables, thereby confirming their suitability for inclusion in the model. Subsequently, a multiple linear regression analysis was conducted using the Stepwise method, incorporating the independent variables (Product, Price, Promotion, and Distribution). This analysis successfully identified the independent variables that exhibited a statistically significant impact on the dependent variable (purchasing decision), accompanied by the corresponding percentage of this influence.

Analysis of Variance (ANOVA)

Upon inputting the independent variables (Product, Price, Promotion, and Distribution) into the equation, an analysis of variance was conducted to assess the effects of these variables. The ensuing results have been presented in Table 9.

Table 8 Results of the VIF and tolerance tests for the independent variables (product, price, promotion, distribution)

Independent variables	Tolerance test allowed variance	Variance inflation factor (VIF)
Product	0.522	1.917
Price	0.556	1.800
Promotion	0.431	2.322
Distribution	0.453	2.208

Table 9 ANOVA results to verify the strength and significance of the multiple linear regression model

No	Source of variation	Sum of squares	Degrees of freedom	Mean square	F value	Statistical significance
1	Regression	50.953	1	50.953	489.045	0.000b
	Residual	41.467	398	0.104		
	Total	92.419	399			
2	Regression	64.284	2	32.142	453.525	0.000c
	Residual	28.136	397	0.071		
	Total	92.419	399			
3	Regression	69.491	3	23.164	400.064	0.000d
	Residual	22.928	396	0.058		
	Total	92.419	399			
4	Regression	71.042	4	17.761	328.174	0.000e
	Residual	21.377	395	0.054		
	Total	92.419	399			

*Statistical significance at the significance level ($0.05 \geq \alpha$)
b: Independent variable (distribution)
c: Independent variables (distribution, price)
d: Independent variables (distribution, price, product)
e: Independent variables (distribution, price, product, promotion)

The analysis of Table 9 reveals that the statistical significance values of the variables are below the predetermined significance level ($0.05 \geq \alpha$), thus indicating a noteworthy and explanatory relationship between the independent variables and the dependent variable. A concise overview of the multiple linear regression model is provided in Table 10.

From Table 11, the following can be observed:

Table 10 Summary of the multiple linear regression model

Model	Correlation coefficient	Determination coefficient	Adjusted determination coefficient	Standard Error of the Estimate
1	0.743a	0.551	0.550	0.32278
2	0.834b	0.696	0.694	0.26622
3	0.867c	0.752	0.750	0.24062
4	0.877d	0.769	0.766	0.23264

a: Independent variable (distribution)
b: Independent variables (distribution, price)
c: Independent variables (distribution, price, product)
d: Independent variables (distribution, price, product, promotion)

Table 11 Significance of coefficients for standardized and unstandardized multiple linear regression equation

Model	Multiple linear regression model	Unstandardized	Standardized	t Value	Statistical significance
	Constant	B	Std. error	Beta	
1	Constant	1.494	0.133		11.271
	Distribution	0.674	0.030	0.743	22.114
2	Constant	0.746	0.122		6.104
	Distribution	0.448	0.030	0.494	14.921
	Price	0.395	0.029	0.454	13.715
3	Constant	0.366	0.117		3.119
	Distribution	0.325	0.030	0.358	10.801
	Price	0.298	0.028	0.343	10.666
	Product	0.304	0.032	0.322	9.484
4	Constant	0.327	0.114		2.877
	Distribution	0.246	0.033	0.271	7.539
	Price	0.254	0.028	0.292	9.005
	Product	0.270	0.032	0.286	8.531
	Promotion	0.172	0.032	0.197	5.354

* Statistical significance at the significance level ($0.05 \geq \alpha$)

- Main Hypothesis: "There is no statistically significant effect at the significance level ($0.05\alpha \leq$) for the marketing mix elements on the purchasing decision of flower consumers in Amman."
- The value of the correlation coefficient for the independent variable (distribution) is 0.743, with a coefficient of determination (R^2) of 0.551 and an adjusted coefficient of determination of 0.550, which indicates that the independent variable (Distribution) was able to explain 55.0% of the variance in the dependent variable (Purchase decision).
- The value of the correlation coefficient for the independent variables (distribution, price) is 0.834, with a coefficient of determination (R^2) of 0.696 and an adjusted coefficient of determination of 0.694, which indicates that the independent variables (distribution, price) were able to explain 69.4% changes in the dependent variable (purchase decision).
- The value of the correlation coefficient for the independent variables (distribution, price, product) is 0.867, with a coefficient of determination (R^2) of 0.752 and an adjusted coefficient of determination of 0.750, which indicates that the independent variables (distribution, price, product) were able to explain 75, 0% change in the dependent variable (purchase decision).
- The value of the correlation coefficient for the independent variables (distribution, price, product, promotion) is 0.877, with a coefficient of determination (R^2) of 0.769 and an adjusted coefficient of determination of 0.766, which indicates that

the independent variables (distribution, price, product, promotion) were in able to explain 76.6% of the changes in the dependent variable (purchase decision).

In order to ascertain the variables within the marketing mix elements that exert a statistically significant impact on the dependent variable (purchasing decision), significance tests were undertaken on the coefficients of the multiple linear regression equation, both in standardized and unstandardized form. Table 11 illustrates this.

From Table 11, the following can be observed:

- The standardized and unstandardized multiple linear regression equations in the four proposed models demonstrate a significant statistical effect for the coefficients associated with the independent variables (product, price, promotion, distribution). This suggests a positive influence of these variables on the dependent variable (purchasing decision). As a result, we reject the primary hypothesis, which asserts that there is no statistically significant effect, at a significance level of 0.05 or greater, for the marketing mix elements on the purchasing decision of flower consumers in the city of Amman.

From the main hypothesis, the following sub-hypotheses emerge

- Sub-hypothesis 1: There is no statistically significant effect (at a significance level of 0.05) of the product element on the purchasing decision of flower consumers in the city of Amman.

To verify Sub-hypothesis 1, a simple linear regression test was conducted for the product variable on the purchasing decision. Table 12 illustrates this.

The analysis presented in Table 12 reveals a clear positive linear association between the product element and the purchasing decision, as indicated by a correlation coefficient of 0.738. The results of the simple linear regression test confirm that the product element has a statistically significant impact on the purchasing decision, with a significance level below 0.05. Furthermore, the product element accounts for 54.4% of the variability in the purchasing decision, as evidenced by the explained variance. Notably, the regression coefficient (β) of 0.697 indicates a strong positive effect of the product element on the purchasing decision. Consequently, Sub-hypothesis 1, which posits no statistically significant effect of the product element on the purchasing decision of flower consumers in the city of Amman, is refuted.

Table 12 Results of simple linear regression test for the product element and its impact on the purchasing decision

Correlation coefficient value	Explained variance	F value	Statistical significance of F	Regression coefficient value (β)	t Value	Statistical significance
0.738	0.544	476.585	0.00*	0.697	21.831	0.00*

*Statistical significance at the significance level ($0.05 \geq \alpha$)

- Sub-hypothesis 2: There is no statistically significant effect (at a significance level of 0.05) of the price element on the purchasing decision of flower consumers in the city of Amman.

To verify Sub-hypothesis 2, a simple linear regression test was conducted for the price variable on the purchasing decision. Table 13 presents these results:

The findings presented in Table 13 demonstrate a clear and positive linear relationship between the price element and the purchasing decision. This is supported by a correlation coefficient of 0.724, indicating a moderate to strong correlation. The results of the simple linear regression analysis further confirmed the significance of the price element, with a p-value below 0.05. The price element accounted for 52.4% of the variance in the purchasing decision, as indicated by the explained variance. Additionally, the regression coefficient (β) of 0.631 suggests a strong positive effect of the price element on the purchasing decision. Consequently, Sub-hypothesis 2, which posits that there is no statistically significant effect of the price element on the purchasing decision of flower consumers in the city of Amman, is refuted.

- Sub-hypothesis 3: There is no statistically significant effect (at a significance level of 0.05) of the promotion element on the purchasing decision of flower consumers in the city of Amman.

To verify Sub-hypothesis 3, a simple linear regression test was conducted for the promotion variable on the purchasing decision. Table 14 illustrates this:

The data presented in Table 14 demonstrates a clear positive linear relationship between the promotion element and the purchasing decision, as indicated by a correlation coefficient of 0.733. The results of the simple linear regression analysis provide evidence of a statistically significant impact of the promotion element on the purchasing decision, with a significance level below 0.05. Furthermore, the

Table 13 Results of simple linear regression test for the price element and its impact on the purchasing decision

Correlation coefficient value	Explained variance	F value	Statistical significance of F	Regression coefficient value (β)	t Value	Statistical significance
0.724	0.524	439.590	0.00*	0.631	20.966	0.00*

*Statistical significance at the significance level ($0.05 \geq \alpha$)

Table 14 Results of simple linear regression test for the promotion element and its impact on the purchasing decision

Correlation coefficient value	Explained variance	F value	Statistical significance of F	Regression coefficient value (β)	t Value	Statistical significance
0.733	0.537	461.439	0.00*	0.639	21.481	0.00*

* Statistical significance at the significance level ($0.05 \geq \alpha$)

Table 15 Results of simple linear regression test for the distribution element and its impact on the purchasing decision

Correlation coefficient value	Explained variance	F value	Statistical significance of F	Regression coefficient value (β)	t Value	Statistical significance
0.743	0.550	489.045	0.00*	0.674	22.114	0.00*

* Statistical significance at the significance level ($0.05 \geq \alpha$)

promotion element accounts for 53.7% of the variance in the purchasing decision, as reflected by the explained variance. The regression coefficient (β) of 0.639 further confirms a strong positive effect of the promotion element on the purchasing decision. Consequently, Sub-hypothesis 3, which suggests no significant influence of the promotion element on the purchasing decision of flower consumers in the city of Amman, is refuted.

- Sub-hypothesis 4: There is no statistically significant effect (at a significance level of 0.05) of the distribution element on the purchasing decision of flower consumers in the city of Amman.

To verify Sub-hypothesis 4, a simple linear regression test was conducted for the distribution variable on the purchasing decision. Table 15 presents these results.

Based on the data presented in Table 15, it is clear that there exists a direct and positive relationship between the distribution element and the purchasing decision. This relationship is supported by a correlation coefficient of 0.743, indicating a strong association. Furthermore, the results of the simple linear regression analysis demonstrate a statistically significant impact of the distribution element on the purchasing decision, as evidenced by a significance level below 0.05. The distribution element accounts for 55% of the variance in the purchasing decision, as indicated by the explained variance. Additionally, the regression coefficient (β) of 0.674 further confirms the substantial positive effect of the distribution element on the purchasing decision. Consequently, Sub-hypothesis 4, which posits that there is no statistically significant effect of the distribution element on the purchasing decision of flower consumers in the city of Amman, is unequivocally rejected.

5 Discussion of Results

In the study, it was observed that there were significant levels of agreement among respondents regarding the various components of the marketing mix. Notably, the highest average agreement score was observed for the product element, followed by price, and the lowest for promotion. When examining the individual items within the product element, it was found that there were high agreement scores for the arithmetic means. Specifically, the item pertaining to the emphasis on the visually appealing aspect of freshly harvested flowers and the manner in which they are

displayed received the highest ranking. Conversely, the item relating to the provision of information about the characteristics of the flowers and the accompanying care methods received the lowest ranking.

Likewise, there was a notable consensus among respondents regarding the arithmetic means of the price element items, with the statement "High-quality flowers are available at affordable prices" receiving the highest ranking, while "Discounts are offered based on the volume of flower purchases" received the lowest ranking. In terms of the promotion element items, respondents also demonstrated a high level of agreement, with the statement "There is credibility of the flowers promotion advertised" receiving the highest ranking, and "There is repetition in the advertising of recently harvested flowers" receiving the lowest ranking.

In terms of the distribution aspect of the items, there was a notable consensus among respondents, with the item "Flower orders are delivered on time and within a short period" receiving the highest agreement score, while the item "Flower products are available in limited quantities" received the lowest score. Furthermore, the study reveals a statistically significant positive impact of the marketing mix elements, including product, price, promotion, and distribution, on the purchasing behavior of consumers who buy freshly picked flowers in Amman.

The significance ascribed to the components of the marketing mix stems from their capacity to effectively identify marketing channels and enhance profitability by implementing strategies that align with evolving market demands. The examination of these elements plays a pivotal role in market analysis, competitor analysis, and the development of value propositions that align with customer pricing expectations. The marketing mix plan serves to strike a harmonious balance between financial gains and customer satisfaction, bolster brand equity, and facilitate the delivery of the product.

In order to maximize their profits, farmers are driven to present freshly harvested flowers in local markets, leading them to increase production and employ various promotional strategies to distribute their products. These findings are consistent with the research conducted by Khanfar [10], which revealed a correlation between the elements of the pharmaceutical marketing mix (product, price, distribution, and promotion) and the purchasing decisions of patients in Amman's pharmacies. Similarly, Ajman's [2] study demonstrated that the marketing mix significantly influences the purchase decisions of pharmacists, with price exerting the greatest influence. Furthermore, Abu Samra's [1] study emphasized the impact of green marketing mix elements (product, pricing, promotion) on the purchase decision of electric cars in Amman. Lastly, Attri and Jain's [5] study identified several factors that influence online purchasing, including customer personality, marketing and advertising, timing, and in-store presentation.

5.1 Recommendations

1. Maintaining product quality is essential to ensure that it is consistent with consumer preferences and needs. This ensures customer satisfaction and loyalty.
2. Highlight the elements of the marketing mix and constantly develop them to increase the attractiveness of consumers and influence their purchasing decisions about services and products.
3. Flower sellers should create brochures and leaflets detailing the types of flowers available, their prices, care instructions and distribution channels. These materials can be distributed to consumers to encourage them to make a purchase decision.
4. Flower sellers should continue their current distribution policies and work on continuous improvement to adapt to changing trends and consumer demands.
5. Increase promotional campaigns for freshly picked flowers across various advertising channels to raise consumer awareness of their importance and quality.
6. The researchers recommend more research and future research using new variables that may influence purchasing decisions in different sectors.

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Enhancing Profitability Through Sustainability: Unveiling the ESG-Financial Performance Nexus in European Firms



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Abstract This research examines the influence of Environmental, Social, and Governance (ESG) practices on the financial outcomes of European companies, particularly those listed on the STOXX Europe 600 index during the period from 2012 to 2018. The objective is to understand the strategic significance of ESG practices and their correlation with financial outcomes. By analyzing a sample of diverse European firms, the study provides a comprehensive overview of the influence of ESG criteria in a unique economic and regulatory context. The research methodology includes a regression analysis to examine the relationship between ESG scores and Return on Equiry (ROE), while controlling for variables such as firm size, leverage, operational efficiency, and sales growth. The findings reveal a significant positive relationship between ESG performance and ROE, indicating that higher ESG scores correlate with improved financial performance. This result supports the growing body of literature suggesting that sustainable and responsible business practices are not just ethical imperatives but also contribute to financial success. Additionally, the study contributes to the existing literature by offering a multi-country European perspective, contrasting with previous research predominantly focused on single-country analyses. This approach provides new insights into the relationship between ESG practices and financial performance across different national contexts within Europe, a region recognized for its leadership in sustainability and corporate governance. The findings have practical implications for business leaders, investors, and policymakers, emphasizing the importance of integrating ESG practices into corporate strategies for long-term financial success. The study also suggests areas for future research, including the exploration of specific ESG components and their individual impacts on financial performance.

Keywords Sustainability · ESG · Corporate Governance · STOXX · European Firms · Profitability

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1 Introduction

In an era marked by heightened awareness of corporate responsibility and sustainability, the incorporation of Environmental, Social, and Governance (ESG) criteria into corporate strategies has gained substantial importance [15, 30]. This shift reflects a broader recognition by various stakeholders, including investors and regulators, of the long-term benefits and risks associated with ESG practices [5]. The influence of these practices on financial performance has become a focal point in business research. Studies by [9, 10, 17, 29] have highlighted the strategic benefits of transparent ESG practices, linking them to enhanced financial stability and investor confidence. This growing body of research, including the work of Khanchel et al. [21], suggests that comprehensive ESG practices can lead to tangible financial benefits for firms.

Despite these insights, a noticeable gap in the literature remains. This gap is particularly regarding the specific impact of ESG practices on financial performance within the European context. While research like that of Broadstock et al. [8] and Sandberg et al. [35] has begun to explore this relationship, there is a need for more detailed analysis focusing on European firms. This is especially pertinent given the unique economic, regulatory, and cultural landscape in Europe, which could influence the ESG-financial performance nexus differently than in other contexts. Additionally, existing studies often aggregate ESG scores, potentially obscuring the individual influences of ESG factors.

Addressing this gap, the current study aims to analyze the effect of ESG practices on the financial performance of European firms, focusing on those listed on the STOXX Europe 600 from 2012 to 2018. By disaggregating the ESG score and considering various control variables, this research provides a more nuanced understanding of how different ESG aspects affect financial outcomes.

Furthermore, this study makes a significant contribution by adopting a European-level approach, encompassing 17 countries and contrasting with most studies that focus on single-country analyses. Considering the diverse national contexts within Europe, which [13, 16] suggest can influence CSR and ethical practices, this broader approach offers new perspectives and enriches the existing literature. Moreover, given that European companies are often regarded as pioneers in ESG reporting [14, 22, 39], by concentrating on the European market, this study delivers critical insights into the connection between ESG practices and financial performance, highlighting a region recognized for its leadership in sustainability and corporate governance.

2 ESG and Financial Performance

The incorporation of ESG disclosure into corporate strategy has become a focal point in the European business landscape, with a growing body of empirical research underscoring its positive influence on financial performance. This essay synthesizes

these academic findings, illustrating how ESG disclosure is not merely a regulatory compliance or ethical choice but a strategic avenue leading to enhanced financial outcomes.

Initiating this discourse, Buallay [9, 10] identified a significant correlation between ESG disclosure and key financial metrics like ROA and ROE in the European banking sector. This foundational research established the premise that transparency in sustainability practices directly contributes to a company's financial stability and attractiveness to investors [9, 10]. Building on this premise, Liu and Lin [29] extended the understanding of ESG's impact by focusing on risk mitigation. Their study highlighted that clear and effective ESG reporting reduces information asymmetry between internal management and external investors, thereby enhancing corporate transparency. This increased transparency plays a crucial role in fostering investor confidence and preventing financial malpractices, thereby bolstering financial performance [1, 29].

Delving deeper, Khanchel et al. [21] explored the specific impact of the social and governance dimensions of ESG, alongside green innovation, on financial metrics. Their findings are pivotal in demonstrating the direct financial benefits of adopting comprehensive and holistic ESG practices, revealing that such practices lead to tangible improvements in a company's financial metrics [21]. In the same vein, Gholami et al. [18] provided an industry-specific perspective, particularly in the financial sector. In detail, they posited that ESG awareness not only contributes to economic development but also directly benefits borrowers, underlining the role of sustainability in the financial ecosystem's health [18, 32].

Further aligning ESG disclosure with established economic theories, Schiehll and Kolahgar [36] connected their findings with agency theory, indicating that ESG practices play a critical role in enhancing corporate governance, thereby improving overall performance. This alignment illustrates that ESG practices are integral to sound business strategy, extending beyond mere ethical considerations [36]. Additionally, the association between ESG disclosure and stock performance has been a significant area of research, revealing a strong positive link between ESG ratings and stock returns. This correlation suggests that the market perceives companies with robust ESG practices as more valuable, thereby positively influencing their stock prices and overall financial performance [9, 10, 29].

Furthermore, the link between ESG disclosure and a firm's cost of capital has garnered attention, with research indicating that firms with transparent ESG reporting experience lower costs of capital. This phenomenon is likely due to the reduced risk perception among investors, highlighting the financial benefits of sustainability and governance transparency [18, 21]. Moreover, the influence of ESG disclosure on credit ratings has emerged as a notable area of research. Companies with higher ESG ratings typically receive more favourable credit ratings, leading to lower borrowing costs and improved access to capital, significantly influencing their financial performance [2, 36].

In sum, the convergence of these studies paints a robust narrative of the positive effect of ESG disclosure on financial performance. By enhancing transparency, reducing risks, improving governance, and promoting sustainability, ESG practices

offer a multifaceted advantage to companies, leading to substantial financial improvements. This positive link between ESG disclosure and financial performance reflects a paradigm shift in corporate success measurement and achievement. Particularly in Europe, where regulatory and cultural landscapes are conducive to ESG integration, companies are increasingly recognized not just for their financial achievements but also for their commitment to sustainable and ethical practices.

Conclusively, the collective body of research posits that ESG disclosure is a strategic tool that can significantly enhance a company's financial performance. European Companies effectively integrating ESG practices into their operations have aligned with contemporary ethical standards and positioned themselves for financial success. This trend is expected to continue, making ESG disclosure an integral part of corporate strategy, driving innovation, governance, and financial performance across industries. Drawing from the above discussion, we will articulate our hypothesis as follows:

H1: *There is a statistically significant and positive association between ESG disclosure and the financial performance of European companies listed in the EU STOXX 600 index.*

3 Methods

3.1 Data and Sample

In our study, we analyze European firms listed on the STOXX Europe 600 index from 2012 to 2018, focusing on a sample that exemplifies leadership in ESG and sustainability practices, as noted by Martínez-Ferrero et al. [40] and Simnett et al. [39]. The STOXX Europe 600, a subset of the STOXX Global 1800 Index derived from the broader STOXX Europe Total Market Index, comprises 600 companies representing a wide range of capitalizations in 17 European stock markets, including but not limited to the Eurozone. These markets span countries such as Finland, Belgium, Italy, Luxembourg, Austria, Portugal, France, Spain, Poland, Denmark, Germany, Norway, Sweden, Ireland, Switzerland, the Netherlands, and the United Kingdom. This diverse sample, accounting for around 90% of the free-float market capitalisation in the region, offers a comprehensive view of European corporate practices in ESG and sustainability. The data for this study were meticulously collected from the Refinitiv Eikon database, known for its extensive and reliable financial and corporate information. The selection of this period, 2012–2018, is crucial as it captures a critical phase in the integration of ESG considerations into corporate strategies across Europe, thereby providing a robust framework for examining trends and practices in this domain. Moreover, the period targeted in the current study is limited to the period from 2012 to 2018 to eliminate any potential bias caused by the Covid 19 pandemic which started in the year of 2019.

4 Study Variables

This study aims to examine the influence of ESG performance on financial performance, specifically focusing on ROE as the dependent variable. Within this framework, ESG performance, as measured by the score obtained from the Refinitiv Eikon database, stands as the sole independent variable of interest. Specifically, the Refinitiv ESG index serves as a socially responsible benchmark commonly utilized by investors to evaluate companies' performance in environmental, social, and governance areas [33]. The comprehensive environmental pillar score of the Refinitiv ESG index is derived from three categories: (i) resource utilization; (ii) emissions; and (iii) innovation ([34], p. 3).

In addition to this primary focus, several control variables are incorporated to ensure a comprehensive analysis. These control variables include firm size, leverage, operational efficiency, innovation capacity, and sales growth.

ROE, our dependent variable, is employed as a key indicator of a firm's profitability and efficiency in generating returns from shareholders' equity. The study's independent variable, ESG score, is central to understanding how a firm's commitment to environmental, social, and governance factors influences its financial performance. This alignment with ESG criteria is increasingly recognized as a determinant of a firm's long-term success and resilience.

To account for other factors that might affect the financial performance, the study introduces several control variables. Firm size is measured as the natural logarithm of total assets (LnTA), providing an understanding of the scale of operations. Leverage, calculated as the ratio of total debt to total assets (LEV), helps in assessing the financial risk and capital structure of the firms. The efficiency of operations is gauged through the ratio of cash flow from operations to total assets, offering insights into the firm's managerial effectiveness.

Innovation capacity, indicated by the natural logarithm of research and development expenditures (Ln R&D), reflects a firm's investment in future growth and technology, which is critical in today's rapidly evolving business landscape. Lastly, the study considers sales growth, measured by the percentage change in sales revenue, to understand market performance and expansion capability.

This selection of independent variable (ESG score) alongside relevant control variables allows for a targeted analysis of the impact of ESG practices on financial performance, particularly in the context of European firms listed on the STOXX Europe 600 index. The operational definitions of each of these variables are detailed in Table 1, providing a clear foundation for the empirical analysis to follow.

5 Regression Model

To test hypotheses and to examine the effect of ESG score on financial performance, this study used the following regression model

Table 1 Measurement of variables

Variable	Label	Operational definition
Financial performance	ROE	Net income divided by total equity
ESG performance	ESG	ESG score obtained from Refinitiv Eikon database
Firm size	LnTA	Natural logarithm of total assets
Leverage	LEV	Total debt divided by total assets
Operational efficiency	CFO	Cash flow from operating activities divided by total assets
Innovation capacity	R&D	Natural logarithm of research and development expenditures
Sales growth	Salesgrowth	Percentage change in sales revenue from one period to the next

$$\begin{aligned} \text{ROE} = \alpha + \beta 1\text{ESG} + \beta 2\text{LnTA} + \beta 3\text{LEV} \\ + \beta 4\text{CFO} + \beta 5\text{R\& D} + \beta 6\,\text{Salesgrowth} + \varepsilon. \end{aligned}$$

The dependent and independent variables and the error term (ε) and regression coefficients (βk), are as defined in Table 1.

6 Results and Discussion

6.1 Descriptive Statistics and Correlation

The descriptive statistics shown in Table 2 provide essential insights into the variables under investigation. The mean ROE across the sampled firms is 14.195, indicating a moderate level of profitability on average. The ESG score, a crucial variable in this study, shows an average value of 58.216. This suggests that the firms in the sample generally have a moderate-to-high commitment to ESG standards.

Table 2 Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
ROE	14.195	14.108	− 16.050	46.520
ESG	58.216	19.199	1.240	95.250
LnTA	15.293	1.335	12.893	17.818
LEV	0.205	0.145	0.090	0.501
CFO	0.097	0.127	− -0.486	2.803
R&D	10.968	1.987	1.946	16.496
Salesgrowth	0.186	3.896	− -1.000	239.748

The mean value for the natural logarithm of Total Assets (LnTA) is 15.293, reflecting the substantial size of the firms within the STOXX Europe 600 index. The average leverage ratio (LEV) stands at 0.205, indicating that, on average, around 20.5% of the firms' assets are financed by debt. This points to a relatively moderate level of financial leverage among the sampled firms.

Operational efficiency, measured as Cash Flow from Operating Activities to Total Assets (CFO), has an average value of 0.097. This figure suggests that the firms, on average, manage to generate around 9.7% of their total assets in operational cash flow. The mean value for Research and Development (R&D) expenditures, logged for scaling purposes, is 10.968. This indicates a substantial investment in R&D among the firms, reflecting their focus on innovation and future growth.

Lastly, the mean Sales Growth (Salesgrowth) for the sampled firms is 0.186. This value, although positive, indicates a relatively modest growth in sales, on average, which can be reflective of the varied economic contexts and market conditions experienced by the firms in different European countries over the study period.

To assess multicollinearity in our study, we analyzed the Pearson's correlation coefficients between the variables, as detailed in Table 3. The findings indicate moderate correlations without any significant multicollinearity concerns. The highest correlation observed is 0.645 between LnTA (Log of Total Assets) and ESG (Environmental, Social, and Governance score), which, while noteworthy, does not pose a serious multicollinearity issue. Other correlations, such as between ROE and CFO, are moderate and within acceptable ranges. The lower correlations between variables like LEV (Leverage), R&D (Research and Development expenditures), and Salesgrowth with ESG further suggest a minimal risk of multicollinearity. Overall, the correlation matrix confirms that the variables in the proposed model are suitably independent for our regression analysis.

Table 3 Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ROE	1.000						
(2) ESG	0.235	1.000					
(3) LnTA	0.071	0.645	1.000				
(4) LEV	− 0.031	0.177	0.285	1.000			
(5) CFO	0.533	− 0.087	− 0.216	− 0.168	1.000		
(6) R&D	0.067	0.441	0.505	− 0.080	− 0.010	1.000	
(7) Salesgrowth	0.030	− 0.107	− 0.029	− 0.057	0.027	− 0.043	1.000

7 Regression Analysis

Before conducting the regression analysis, we undertook preliminary tests to determine the most suitable model for our data. Initially, the Hausman test was employed to decide between fixed effects and random effects models. The results of this test showed a p-value greater than 0.05, indicating that the random effects model is more appropriate for our study. This suggests that the unobserved individual effects are uncorrelated with the independent variables.

Furthermore, to determine the appropriate model between the random effects model and pooled ordinary least squares (OLS), we performed the Breusch-Pagan Lagrange Multiplier test. The results of this test indicated a preference for the random effects model over the pooled OLS, thereby affirming the suitability of the random effects approach for our analysis.

Table 4 presents two models utilizing the random effects framework. The first model includes all the variables without controlling for year, country, and industry effects. This model provides a baseline understanding of the relationships between the variables. The second model, however, incorporates controls for year, country, and industry, offering a more refined analysis by accounting for potential confounding effects due to temporal, geographical, and sectoral differences.

Additionally, to address potential heteroscedasticity issues in the data, both models employ robust standard errors. This adjustment ensures that the standard errors are reliable and the statistical inferences drawn from the models are valid, despite the presence of heteroscedasticity. The use of robust standard errors is particularly important in panel data analysis, where heteroscedasticity and serial correlation are common concerns.

The regression analysis in Table 4, particularly model 2, offers significant insights into the relationship between ESG performance and financial performance, as represented by ROE. This model, which controls for year, country, and industry factors and employs robust standard errors, reveals some key findings.

ESG score exhibits positive and statistically significant impact of ESG score on ROE ($\beta = 0.224, p < 0.05$) in our study strongly supports the hypothesis that enhanced ESG performance contributes to improved financial performance. This finding is a testament to the strategic value of integrating ESG criteria into corporate practices, a perspective increasingly recognized in contemporary research.

The rationale behind this positive correlation is multifaceted. Firstly, ESG-focused practices often lead to operational efficiencies and risk mitigation. Emphasizing sustainability allows companies to decrease expenses linked to energy usage, waste disposal, and adherence to regulations. Studies by [9, 10, 29] in the European banking sector illustrate that firms with higher transparency in sustainability practices not only experience financial stability but also gain increased investor confidence due to perceived lower risks.

Moreover, ESG practices align with consumer and investor values, particularly in the current socio-economic climate where there is growing awareness and demand for sustainable and socially responsible business operations. This alignment often

Table 4 Regression analysis

	(1)	(2)
Variables	Random effect	Random effect
ESG	0.180**	0.224**
	(0.0846)	(0.0958)
LnTA	3.990**	2.855**
	(2.718)	(3.057)
LEV	− 1.390**	− 3.475*
	(25.73)	(26.98)
CFO	161.8***	163.5***
	(25.72)	(24.72)
R&D	8.75e−07	1.49e−06
	(1.65e−06)	(1.82e−06)
Salesgrowth	0.417*	0.502*
	(0.410)	(0.395)
Constant	53.25	21.84
	(38.15)	(41.48)
Year	NO	YES
Country	NO	YES
Industry	NO	YES
Observations	2,543	2,543
Adj-R-squared	0.095	0.115

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

translates into stronger brand loyalty, enhanced reputation, and access to new market segments, all contributing to financial performance.

Khanchel et al. [21] further emphasize the direct financial benefits of ESG practices, indicating that companies that actively engage in environmental stewardship, uphold social responsibilities, and maintain robust governance standards often experience improved profitability and market valuation. This could be attributed to the fact that these practices enhance a company's capability to attract and retain top talent, stimulate innovation, and improve long-term strategic planning.

Furthermore, integrating ESG principles can lead to better access to capital. Investors and financiers are increasingly considering ESG factors in their investment decisions. Companies with strong ESG practices often benefit from lower capital costs and improved investment returns, as evidenced by Broadstock et al. [8] and Sandberg et al. [35]. This is particularly relevant in the context of sustainable investing, which has witnessed significant growth over recent years.

Finally, there is an aspect of regulatory compliance and foresight. Companies that proactively adopt ESG standards are often better prepared for future regulatory

changes, thereby avoiding potential fines and penalties. This proactive approach can also position companies as industry leaders, setting them apart from competitors.

Concerning control variables, Cash Flow from Operations (CFO) shows a substantial positive relationship with ROE ($\beta = 163.5$, $p < 0.01$). This finding is consistent with previous research emphasizing the pivotal role of CFO in enhancing a firm's profitability [23]. Efficient management and generation of operational cash flow are crucial in predicting future earnings and ensuring financial stability.

The positive influence of firm size (LnTA) on financial performance ($\beta = 2.855$, $p < 0.05$) supports the idea that larger firms tend to have better financial outcomes. This is in line with research by Halid et al. [19] and Lisin et al. [41], which indicates that larger firms, due to their resources and capabilities, engage more effectively in ESG activities, thereby enhancing their ESG scores and financial performance.

Conversely, financial leverage (LEV) demonstrates a negative relationship with ROE ($\beta = -3.475$, $p < 0.1$). This supports findings by Alareeni and Hamdan [4] and Lee [25], suggesting that high financial leverage can impede a company's ability to engage in ESG initiatives. High levels of debt may constrain resources that could otherwise be allocated to sustainable practices, impacting both ESG performance and profitability. Similarly, Shobhwani [38] noted that high leverage negatively impacts ESG disclosure, as companies prioritize meeting debt obligations over investing in ESG activities. Adeneye et al. [3] also observed that high leverage might hinder maintaining strong ESG practices due to financial constraints.

In conclusion, our regression analysis elucidates the complex interplay between ESG performance, operational efficiency, firm size, financial leverage, and financial performance. It highlights the strategic importance of ESG practices in enhancing financial outcomes, while also underscoring the potential constraints posed by financial leverage on ESG performance and disclosure. These findings contribute to the growing body of literature that emphasizes the multifaceted benefits of ESG integration in corporate strategy, particularly in the European context.

8 Conclusion

In conclusion, this study significantly contributes to the understanding of the relationship between ESG practices and financial performance, focusing on European firms listed on the STOXX Europe 600 from 2012 to 2018. The study's outcomes, which align with [9, 10, 29], underscore the positive connection between ESG performance and ROE, suggesting substantial practical implications.

For corporations, these results emphasize the strategic benefit of integrating ESG practices into their operational models. Firms are encouraged to enhance their ESG performance as a means to improve financial performance, which is consistent with the observations made by Khanchel et al. [21] about the direct financial benefits of comprehensive ESG practices. This insight should motivate corporate strategists and sustainability officers to consider ESG initiatives as integral to value creation.

The findings also have significant implications for investors and asset managers. The beneficial relationship between ESG factors and ROE indicates that integrating ESG criteria into investment strategies is essential, aligning with the sustainable investing trend and echoing the insights from Broadstock et al. [8] and Sandberg et al. [35] on ESG's influence on financial performance.

From a policy standpoint, these results support the development of robust ESG reporting and compliance frameworks, aligning with the regulatory trends observed by Halid et al. [19] and Lisin et al. (2022) regarding larger firms' inclination towards ESG activities.

However, the study has limitations. The reliance on ROE as a primary measure of financial performance could be broadened in future research by incorporating Tobin's Q, offering a market valuation perspective as suggested by studies like Adeneye et al. [3]. Additionally, examining the specific impacts of environmental, social, and governance components separately could provide a more nuanced understanding, as indicated by research trends noted in Alareeni and Hamdan [4] and Lee [25]. Moreover, extending the study's timeframe and incorporating a more current data set would also address the limitation of the study's period and capture the evolving nature of ESG practices post-2018.

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Application of Artificial Intelligence in Insurance Companies: A Bibliometric Review and Content Analysis



Muath Asmar and Mohammad Jaradat

Abstract In the insurance industry, artificial intelligence (AI) has become a disruptive technology with several uses. This report examines the advancements made in AI application development within insurance businesses between January 2015 and March 2024. The study uses a hybrid methodology that combines text analysis and bibliometrics to show the current research trend of AI applications in insurance businesses. We obtain 291 documents from the Scopus database, which we then examine with VOSviewer. A bibliometric analysis provides an inclusive analysis of significant trends, research themes, and citation patterns within the field of AI applications in insurance. It offers insights into the development and present status in this particular field of research. The content analysis provides a detailed overview of AI applications in insurance including, claims processing, underwriting and risk assessment, fraud detection, customer service and predictive analytics. The content analysis as well provides a detailed challenges and limitations, future directions and implications, of AI applications in insurance. The study's conclusions show that there is a growing body of academic literature analyzing various AI technologies—such as machine learning, natural language processing, and predictive analytics—used by insurance firms. These technologies are being investigated for their potential applications in underwriting, claims processing, risk assessment, and customer service within the insurance companies. Practitioners, policymakers and researchers can benefit from the insightful findings of this study to effectively harness the potential of AI in order to promote innovation and facilitate transformation within the insurance industry.

Keywords Artificial intelligence · Machine learning · Deep learning · Insurance companies

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1 Introduction

The insurance industry has experienced a significant change in recent years due to advancements in artificial intelligence (AI) technologies. AI refers to a computer system that can learn, comprehend, sense its environment and act based on what it is learning [1]. AI includes machine learning, natural language processing, and other cognitive computing methods, has become a significant driver of innovation and change in multiple industries. AI is a growing technology that is being progressively employed in insurance technology for various back-end functions, including algorithmic trading, financial search engines, blockchain analytics, and fraud detection [2]. For instance, A deep learning model has been suggested for the purpose of detecting automotive insurance fraud. This model utilizes Latent Dirichlet Allocation based text analytics [3]. Further Palacio [4] propose an approach utilizing semi-supervised methods for the purpose of detecting insurance fraud. Kose et al. [5] have developed an interactive machine learning-based framework for detecting fraud and abusive behaviors in the healthcare insurance industry. Baudry and Robert [6] have present a nonparametric and flexible approach for estimating outstanding liabilities using a machine learning based technique. Neumann et al. [7] have presents an approach for forecasting a car driver's decision about the acquisition of a replacement vehicle subsequent to a vehicular collision, employing machine learning techniques.

The aforementioned examples of AI's use in insurance operations show how AI is changing the insurance sector. The number of scientific publications on AI's application in the insurance industry has significantly increased recently. Using bibliometric methods such as VOSviewer, the aim of this study is to investigate global trends and advancements in the application of AI in insurance research. These technologies identify new trends, map collaboration networks among the research community, and uncover key scientific concepts using natural language processing and data visualization. Furthermore, the current study provides a thorough review of AI's applications in the insurance sector by using a content analysis. These applications include risk assessment, underwriting, claims processing, fraud detection, and customer support.

AI can enhance insurance operations, increase risk ratings, adapt client interactions, and prevent fraud. Insurance businesses must employ AI to be competitive and sustainable in the digital age due to rising competition, changing client expectations, and complex risk conditions. Thus, the goal is to identify new research opportunities and knowledge gaps in this field. This information will help researchers and policymakers stay current and guide future research, resulting in more appropriate AI tools for the insurance business.

2 Methodology and Bibliometric Analysis

In this study, the bibliometric technique suggested by Cobo et al. [8] makes use of tools for performance analysis and scientific maps to analyze the research domain, identify important regions, and illustrate theoretical subfields.

Using a bibliometric review approach, the main resource for reviewing research and scientific publications was the Scopus database. Using this platform's targeted keywords, we were able to identify earlier research on the subject of our investigation. The research was then improved and sifted. The goal of this painstaking procedure was to get the study closer to the main idea.

A total of 291 document references, including keywords, abstracts, and citation metrics, were consulted in Scopus. These references were gathered from the database. This was accomplished by using the search terms "insurance," "artificial intelligence," "machine learning," and "deep learning" while looking through various document article categories and choosing English-language publications.

Keywords

The most common terms in the re-search are shown in the accompanying figure, which also gives an idea of the themes that are often discussed. This provides us with a first understanding of the patterns seen by the researchers in this area (see Fig. 1).

One of the most occurring keywords is "machine learning", as it is the fundamental technology in most AI applications in the insurance sector, it include complex algorithms that work on fraud detection [9], claims prediction [10], and more. The following keyword is "insurance", which is the sector that adopts and uses these technologies to improve the performance and efficiency of its activities. The term "artificial intelligence" is the fourth keyword, followed by "health insurance", which

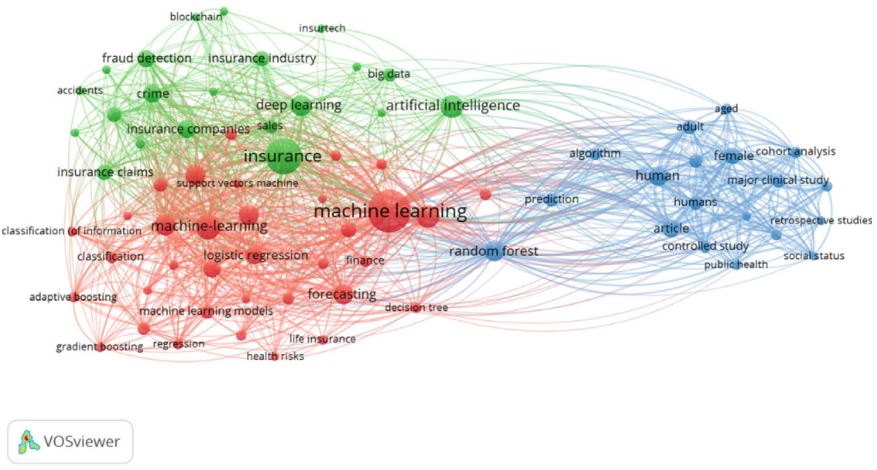


Fig. 1 Keywords linkage between articles

Table 1 Keywords occurrence in articles

Keywords	Occurrence
Machine learning	166
Insurance	122
Machine-learning	58
Artificial intelligence	50
Health insurance	48
Deep learning	43
Decision tree	42
Learning systems	38
Forecasting	38
Learning algorithms	38
Random forest	37

is the most expansive area in insurance due to its diverse cases and broad scope, allowing the application of AI in various ways. Then comes "deep learning", which is the most advanced technology of machine learning, incorporating more sophisticated technologies capable of speech and image recognition and understanding. Table 1 present the ranking of words based on their occurrence in the research.

Countries

The majority of the document and cited research was attributed to India with a total of 78 documents and 502 citation, these articles may be attributed to the increasing population as well as being a developing country that seeks to embrace such technologies to develop its economy, followed by United state with 44 documents and 319 citation, where it holds one of the largest insurance markets in the world, in addition to being an advanced country leading in the use of technology such as AI, and several other countries contributing as well. Table 2 illustrate the countries number of citation and total link strength. Additionally, there are links between the research papers in these countries Fig. 2. Present the linkage between countries.

Number of Articles Based on years

It seems that research on the application of AI in the insurance sector with the technologies like machine learning and deep learning began to emerge in the late twentieth century and expanded slowly until 2018, which witnessed the beginning of widespread adoption in this field. Figure 3 shows the number of articles based on years it published.

Table. 2 Countries number of citation and total link strength

Countries	Documents	Citation
India	78	502
United states	44	319
China	35	367
South Korea	18	123
United kingdom	12	53
Taiwan	10	234
Egypt	10	82
Australia	9	85
Germany	9	36
Malaysia	9	12
Canada	8	76
France	8	82
Italy	8	54

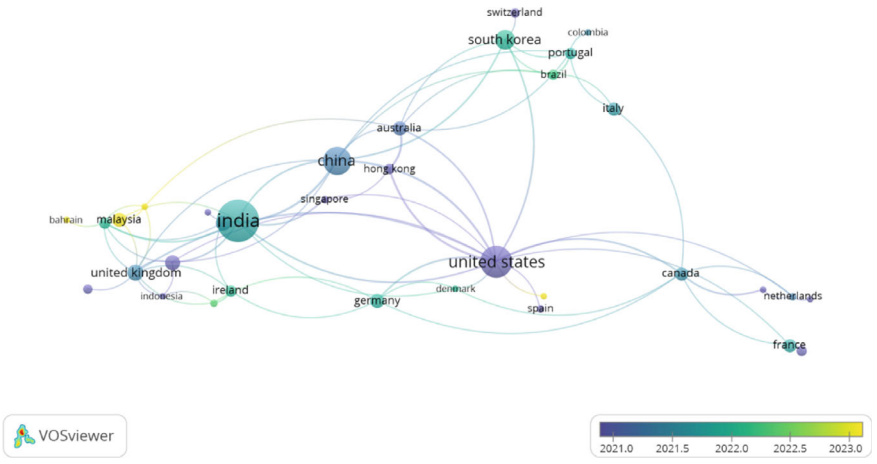


Fig. 2 Linkage between countries

3 Overview of AI in Insurance

AI is a broad term that lacks a universally agreed-upon definition, but several concepts are commonly used to define it. Some define it as an analytical tool for dealing with complex challenges [11], while others describe it as a computer system programmed to simulate human characteristics while efficiently and effectively completing tasks beyond human capability. Its recognized characteristics include sensing and understanding its environment, learning from it, and making decisions based on the entrusted tasks [1].

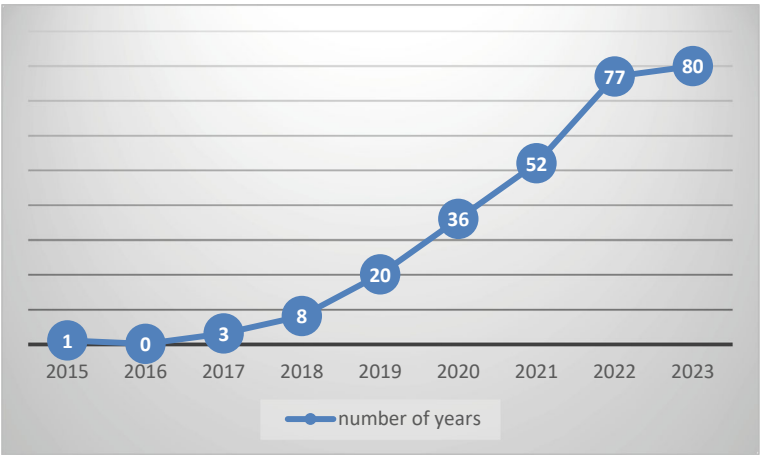


Fig. 3 Number of articles based on years it published

The expansion of AI encompasses various concepts and technologies that clarify its characteristics and capabilities. Among these is XAI (explainable AI), which involves human involvement in decision-making stages using AI [12]. In addition to AI expansions, there are technologies like machine learning technology [13], which uses models to evolve and provide a deeper understanding of data. What makes it the most popular technology is its ability to continuously evolve by continuously adding variables [14], and artificial neural network (ANN) technology, which simulates the human brain and aids in discovering connections [15]. In addition, other technologies are adopted by various sectors, such as the financial sector (FinTech) and the insurance sector (InsurTech) [16].

The evolution of AI has transformed it from simple capabilities to a technology with a multitude of capabilities, thanks to advancements in machine learning and deep learning algorithms, as well as the availability of big data. AI is now capable of pattern analysis, speech recognition, natural language generation, and image recognition [17], and has entered various applications such as chatbots that emerged in the 1950s and 1960s and evolved due to technological advancements and people's inclination towards using social media applications, especially messaging apps [2].

As with any evaluation in any institution, the adoption of any development is assessed based on a cost–benefit analysis. AI technologies are cost-saving techniques achieved through the use of additional customer insights to personalize interactions, which is a major driver for revenue growth [17]. In addition to their efficiency in various activities such as investments, where they reduce risks [13], AI also deals with uncertainty resulting from data unreliability and its lack of full relevance [18].

4 Applications of AI in Insurance Companies

Predicting claims is the most important challenge facing the insurance sector, which is why it is important to use AI techniques in claims prediction. These technologies address the problems faced by traditional methods, such as missing values in data. Technologies like machine learning have been able to predict claims in car insurance [19], and more accurate technologies like deep neural networks, which are among the most important machine learning methods, have been used to predict claims in travel insurance [20].

Processing current claims involves using technologies in two directions. The first direction focuses on evaluating repair costs, such as home and commercial property insurance claims as well as car claims, through image recognition technology [21]. The second direction involves verifying the accuracy of these claims by detecting fraud. The accuracy of these claims is not only limited to fraudulent repair costs that are avoided but also affects the subsequent recommendations suggested by recommendation engines, which are influenced by these claims [17].

This insurance activity has utilized a variety of analytical technologies, including predictive analysis through big data, to enhance the assessment of insurance risks [22]. Based on this, subsequent decisions and other uses were built, where smart damage identification systems were developed, proving their efficiency in insurance cases, especially small ones, which accounted for 72.22% according to data from the China Banking and Insurance Regulatory Commission Office [23]. Risk assessment is just one part of a series of activities performed by these systems, including investigating the accident, using vehicle image reading techniques, understanding the damages incurred, estimating these damages, and determining whether they are fraudulent or not.

Using machine learning and deep learning technology, fraud detection has become easier through algorithms developed by storing data and documents related to customer policies, creating customer behavior profiles, and training algorithms on them to become capable of pattern detection to identify patterns, trends, and preferences [24]. Another approach is to utilize the reinforcement learning method through the deep Q-network to detect fraudulent or illegitimate insurance claims [25].

Fraud can be detected either through signatures and handwriting in documents using image and video recognition [24] or by using these technologies on images such as vehicles involved in accidents. The technologies then understand the damages, estimate them, and determine whether they are fraudulent or not [23]. However, continuous development of these capabilities is necessary to ensure accuracy and prevent algorithmic bias that could lead to false fraud accusations [21].

Through the development of precise algorithms that engage intelligently with customers, several AI applications have been created for customer interaction. Among these applications, there are those focused on artificial interaction, such as conversation agents [26] and chatbots, which provide automated recommendations for services and products. To enhance the security of this interaction, in complex

cases, there may be a mechanism to redirect customers to real employees [24]. ChatBots technologies rely on various AI capabilities such as speech recognition, natural language generation, text analysis, and language processing [17]. These capabilities aid in understanding and interpreting texts, converting them into datasets for algorithm development, and using them to generate outputs. Through machine learning and AI, some InsurTech companies have developed models. Their primary goal is to enhance enrollment and claim settlement processes [13].

Additionally, emotion and sentiment detection capabilities from written and spoken words are employed for specific goals within contract administration and customer service activities. These goals include increasing customer service efficiency by sorting and categorizing customer messages for appropriate handling [17], responding appropriately to customers after reading their written or spoken words, and analyzing their emotions, which aim to improve customer satisfaction and retention.

Among other applications similar to ChatBots are Robo-Advisors, which focus on supporting customers with automated advice by suggesting individual policy recommendations. The requirements for such applications include implementing precise algorithms to enhance intelligent interaction with customers. Another application is smart contracts, which heavily rely on blockchain technology to enable automated contracts. The goal is to reduce costs, and overall, Robo-Advisors and Smart Contracts serve as back-office functionalities [24].

AI technologies predict future outcomes using various methods and models by utilizing datasets. For instance, in life insurance risk prediction, historical data is used through the XGBoost machine learning method to enhance risk prediction models and classify risks. XGBoost performs well in handling missing values in the data [27]. On the other hand, other algorithms like Random Forests utilize hydrological and socio-demographic data for predicting and classifying insurance data against floods [28].

Predictive analytics extends beyond risk estimation to encompass other activities like marketing. We have developed special models for marketing activities related to telemarketing calls, which some find annoying. Predictive models help reduce customer complaints [29].

5 Challenges and Limitations of AI in Insurance

The presence of ethical problems is a major reason for customers stepping back from dealing with companies that adopt the use of AI applications. Mullins et al. [21] have developed a hierarchical ethics model of AI and big data in insurance markets, dividing it into four levels to illustrate the ethical issues that undermine trust in insurance companies embracing AI technologies.

In the first level, the problem arises from constructing complex algorithms using massive databases, leading to difficulties in understanding them for non-experts. This is why there is a shift towards explainable AI (XAI), which provides a better

understanding of AI technologies like machine learning [30], allowing for a more transparent and understandable relationship between humans and machines in various activities such as claims management, contract writing, and pricing [12].

In the second level, which involves data used in image recognition, voice recognition, and analytics technologies, it includes personal data that customers do not consent to being used for purposes other than insurance calculations. The relationship between the insured individual and private or public insurance companies is based on trust [31].

At the third level, based on algorithmic bias, discrimination due to statistical evidence among equally risky individuals, whether direct discrimination, differential treatment, or even indirect discrimination, even if its solution reduces the accuracy of predictions [32], is an ethical issue.

While the fourth level, which is privacy violation, specifically involves technologies related to the Internet of Things that access individuals' private data, it serves as a reference for determining the validity of insurance claims.

6 Future Trends and Opportunities in AI in Insurance

The most significant advancements in AI have come through machine learning and deep learning techniques [17]. Deep learning, in particular, stands out for its ability to interpret outputs such as images and speech, among others. It is used in image processing to detect fraudulent claims in car accidents [33]. Additionally, it is utilized in the field of digital currencies to predict currency prices characterized by price volatility [34]. Deep learning also constructs effective marketing models for sales forecasting and analysis [35]. Furthermore, it finds applications in various activities within the insurance sector and beyond, such as optimal reinsurance, investments, and dividend strategies [36].

The core machine learning technologies utilize algorithms developed using big data to predict fraud in insurance [9]. These technologies can read patterns and trends, thereby predicting recurring claims in insurance [10].

Data from telematics and IoT devices is used through algorithms, AI technologies, and machine learning to predict insurance amounts such as health insurance [37], and data extracted from driving behavior, which has a stronger causal relationship with accidents, effectively assists in predicting risks for car insurance pricing [38]. Some systems used in prediction monitor various aspects such as driving speed and safety measures like seat belts, door locks, airbags, and hand brakes. In addition to their benefits for insurance, they also help in sending alerts such as low fuel warnings and insurance reminders [39].

Insurance companies seek to customize insurance policies and provide them with special pricing using AI technology, specifically neural network technology that can read telematics data and unstructured data [40]. However, pricing adjustment remains a prevalent issue as insurance companies aiming to increase revenues see the only way to do so is by raising the value of insurance renewals, which contradicts their

vision of attracting new customers [41, 42]. Aside from the ethical problems that arise from pricing through this technology, insurance companies also resort to excluding less profitable segments [21].

7 Future Directions and Implications

These developments pave the way for integrating the Internet of Things in homes, vehicles, and even the healthcare sector, enhancing the customization of products for customers. The existence of these technologies reduces insurance risks by reducing human errors in determining the validity of claims and the estimated compensation amount, and that risk are the most significant challenges in the insurance sector.

Internal management within insurance institutions is as important as customer insurance management. It bears many risks, including internal decisions, employees, and other factors. The emergence of systems based on AI algorithms in areas such as employee retirement management imposes costs on these institutions equal to the risks insured [14]. This opens up a broader scope for studying internal systems in the insurance sector and developing AI technologies, such as machine learning, in these areas.

It is possible to explore other approaches in the future to address the issue of insurance pricing [41]. One of the available avenues to study is integrating internet of things (IoT) technology with insurance contracts, which could lead to risk reduction. Instead of insurance companies focusing on increasing returns, the emphasis should be on reducing costs by mitigating risks and incorporating internet of things (IoT) technology as a regulatory component for insurance company clients.

It is also better to try to develop smart systems and increase the accuracy of their results, or explore ways to share tasks with human elements if it becomes impossible to improve their accuracy. This can be done by relying on AI for specific cases only, after studying its results for different cases individually.

8 Conclusion

The primary goal of using AI technologies is to better understand and assess risks, leading to the development of services and more suitable insurance pricing. However, this understanding of risks has brought to light other risks related to ethics and customer privacy. This does not mean that technological advancement has been fundamentally harmful, but rather that its rapid development has outpaced the evolution of the regulations and laws governing it [21]. As for the areas that have shown promise for the development of the insurance sector and IoT technologies in particular, they are still in the early stages of study and have not been sufficiently addressed in scientific research. They touch on high-risk matters that need to be developed for

high accuracy, in addition to studying their impact on different markets as they carry different characteristics regarding the acceptance of new technology.

And the differences between countries in their adoption of AI technologies were more closely related to the development of technological infrastructure and awareness of using this type of technology, in addition to the regulations and laws that need to be developed more quickly to govern the use of these technologies and allow for their broader application.

Of course, both insurance companies and customers need to consider the benefits of AI technologies, as well as their issues and adoption barriers. These technologies assist insurance institutions by analyzing patterns [17] and discovering connections [15] in claims to detect fraudulent claims, which are one of the biggest problems they face. Additionally, AI accelerates the process of verifying vehicle damage in auto insurance. Some of the smart systems developed perform the functions of many insurance company employees. By capturing images of the accident, these systems verify the accident and estimate damages, then provide recommendations for repair lines and costs. This speeds up the process of investigating accidents, benefiting both the insurance institution and customers [23], however, these systems are not accurate enough to be fully used in damage investigations. One system developed in China proved to be 72.22% effective, which calls for reconsidering the trust in AI technologies at this time [23].

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Does Internal Auditing Impact the Achievement of Sustainable Development in the Banking Industry?

Kayed M. Tanbour and Abdulnaser I. Nour

Abstract "The focus of this study was to look at the impact of internal auditing practices within banks listed on the Palestine Exchange on the attainment of sustainable development goals". The study sample comprised 60 individuals selected randomly from the internal audit departments of the banks. To fulfill the study's aims, a descriptive methodology was employed. A questionnaire, designed explicitly to address the study's objectives, was utilized. Additionally, after conducting data analysis, the findings demonstrated a significant influence for each of the (internal audit's independence, objectivity, and professional care) on achievement of sustainable development, therefor, the study recommended that it is It is imperative to persist in improving the expertise Sure! Here is the text rewritten: "Enhancing the skills and knowledge of internal auditors is essential expanding and diversifying training programs focused on sustainable development in banks". This will equip them with updated skills in these areas.

Keywords Internal audit · Sustainable development · Banks sector

1 Introduction

The banking industry faces increasing pressure from stakeholders to address sustainability issues and demonstrate their commitment to corporate social responsibility. "It is therefore essential that the issue of sustainability and the implementation of CSR into core activities in banking operations gain the confidence of stakeholders" [1].

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Achieving sustainable development poses a challenge for banks in terms of their ability to preserve their systems, transactions, and operations across various economic, social, and environmental levels. Banks must incorporate sustainability Integrating risks associated with climate change into their risk management strategies to mitigate such risks, environmental degradation, and social inequality. They must also develop sustainable lending and investment practices to promote sustainable and inclusive growth. Banks must encourage the adoption of sustainable business practices among their clients. In recent years, the importance of sustainable development and corporate social responsibility has been increasingly recognized by various industries, including the banking industry [2].

One of the theories associated with institutional governance is agency theory, which is an economic and management theory that focuses on the relationship between agents (employees or managers) and principals (owners or shareholders) in organizations or companies. This theory assumes that there is a potential conflict between agents and principals due to differences in their goals and interests, illustrates how conflicting interests and asymmetric information can lead to agency problems [3]. The presence of multiple stakeholders in a bank lead to a rise in agency conflicts, while the intricacy of its operations results in significant information asymmetry, thus heightening the challenges associated with monitoring processes [4].

Therefore, internal auditing can help alleviate agency problems. Where internal audit plays a crucial role in promoting sustainable development within the banking industry as one of its governance mechanisms. By focusing on compliance with environmental regulations, social and ethical responsibilities, risk management, and transparency and accountability, internal auditors contribute to improving the bank's sustainability performance. By doing so, internal audit strengthens the banking industry's overall contribution to sustainable development [5].

Internal audits help banks identify and address potential risks and opportunities associated with their operations. They can provide the bank with insight into its financial performance and corporate governance. Furthermore, internal audits can also provide feedback on the bank's sustainability efforts [6].

Furthermore, internal audit contributes to reporting accuracy and transparency by assessing the reliability of sustainability-related data. They ensure that sustainability metrics align with relevant regulations and frameworks, such as ESG (Environmental, Social, and Governance) reporting. This commitment to accuracy helps foster trust in the organization's sustainability efforts and promotes accountability to stakeholders [7].

The banking sector offers a significant framework for our study, with a substantial amount of research focusing on the influence of internal audit on the attainment of sustainable growth in non-banking organizations. Nevertheless, there is a dearth of literature examining this correlation within banking institutions, especially in the context of Palestine. The primary objective of this article is to bridge this gap and enrich the current body of knowledge by presenting empirical proof regarding the impact of internal audit on the achievement of sustainable growth in the banking sector of Palestine. This inquiry leads us to ponder whether internal audit contributes

to the realization of sustainable development. The research endeavors to address the ensuing pivotal query:

Does internal audit impact the achievement of sustainable development in the banking industry?

This study aims to identify the potential impact of internal audit practices (the internal audit's independence, objectivity, and professional care) on achieving sustainable development goals. Specifically, the study will explore how internal audit functions can contribute to sustainable development in areas such as environmental sustainability, social responsibility, and economic stability. This study will investigate the internal audit factors that impact the achievement of sustainable development in the banking industry and quantify sustainable development achievement in Palestinian Banks.

Accordingly, **the significance of the study,** assisting bank management boards in recognizing the contribution of internal auditing to sustainability in the banking industry, and providing the Palestinian Monetary Authority with an incentive to focus on enhancing the competencies of internal auditors in banks, highlights its importance as an addition to existing literature on the reality of internal auditing and its role in achieving sustainability in banks.

This study stands as the sole examination delving into the influence of internal audit activities on the attainment of sustainable development within the banking sector. Furthermore, it represents the pioneering effort to gauge the extent of sustainable development achievements within banks listed on the Palestine Exchange. Consequently, the paper contributes significantly and innovatively to scholarly literature on the accomplishment of sustainable development.

2 Literature Reviews and Development Hypotheses

2.1 Literature Reviews

The banking sector plays a vital role in the economic development of countries and has a significant impact on sustainable development initiatives. The role of internal audit in promoting and ensuring sustainable development of banks has become an interesting topic in the literature. Several studies have explored the relationship between internal auditing and sustainable development in the banking industry.

Research [8] shows that the quality of the internal audit system directly affects the financial performance of banks. An effective internal audit function has been found to mediate the relationship between corporate governance and sustainability reporting practices, thereby improving the level of sustainability disclosures. Furthermore, sustainability assurance, internal controls and audit errors have a significant impact on audit practice, demonstrating the interconnectedness of these factors in promoting sustainability in the banking industry, the study [9] emphasizes the multifaceted impact of internal audit on sustainable development within the banking industry.

Firstly, the quality of internal audit is intrinsically linked to financial performance, as it ensures robust risk management and effective internal control systems. This, in turn, contributes to the long-term sustainability of banks by mitigating risks and bolstering overall performance. Secondly, the moderating role of internal audit functions in corporate governance and sustainability reporting practices underpins the significance of internal audit in fostering transparency and accountability, which are fundamental pillars of sustainable development.

As well, a study [10] has shown that despite the positive impact of internal audits on sustainable development in the banking industry, there are potential debates regarding the extent of its influence. Some may argue that other factors, such as external market forces or regulatory requirements, play a more significant role in driving sustainable development. However, it is essential to recognize that internal audit functions act as a critical internal mechanism for ensuring compliance with external regulations and aligning organizational practices with sustainable development goals. A previous study [11] demonstrated a favorable correlation between independent internal audit and risk management governance, leading to improved evaluations of external audit risks. Moreover, effective risk management governance was found to have a direct positive influence on external audit risk assessments, further augmented by its indirect positive impact on risk evaluation.

The results of study [12] "revealed that both independence and competence significantly affected the effectiveness of internal auditing. Moreover, it was observed that top management support indirectly influenced internal audit effectiveness through its effects on competence and independence. However, the direct impact of top management support on internal audit effectiveness did not show statistical significance". The results of study [13] "emphasized the significant impact of resources on integrity, which subsequently influenced the effectiveness of internal auditing. Furthermore, it was noted that senior management support contributed to enhancing integrity, objectivity, and moral courage, thereby bolstering the effectiveness of internal audit". Study [14] "findings unveiled that the competence and objectivity of internal auditors, alongside management support, play a crucial role in determining the effectiveness of the internal audit function. Additionally, it was observed that the competence and objectivity of internal auditors, as well as the effectiveness of the internal audit function, have a significant impact on the quality of financial reporting". Furthermore, research [15] shows "that competence, objectivity and independence have a significant impact on the effectiveness of internal auditing. Furthermore, management support moderates the effects of competence, objectivity, and independence on internal audit effectiveness". The study [16] reached several conclusions, "the most important of which is the lack of causal relationship between internal audit's agile working methods and the sustainability reporting of the sample banks. This confirms the research hypothesis and suggests that there is no statistically significant causal relationship between internal audit agile working practices and sustainability reporting".

The conclusion drawn from study [17] was "that internal audit and corporate governance have a substantial impact on the real estate sector, given their positive correlation with the industry's sustainable development. Estate Industry", while the

study [18] the major that "the auditor plays when auditing the sustainable development and sustainability reports has been identified in achieving the requirements of sustainable development, in addition to that there are several auditing standards that can guide the performance of the audit of sustainable development". While a study [19] showed "Internal auditing positively affects the firm's long-term value and performance, indicating its role in promoting sustainable business practices and contributing to the achievement of sustainable development goals".

In conclusion from the above, internal audits significantly impact the achievement of sustainable development in the banking industry. The empirical evidence supports the notion that internal audit quality is positively associated with financial performance and sustainability reporting practices. As such, fostering effective internal audit systems is essential for promoting sustainable development in the banking sector, ultimately contributing to the stability and resilience of the financial industry.

How Is the Current Study Different?

What sets the current study apart is its focus on examining the impact of internal auditing on the attainment of sustainable development within the banking industry, with a particular emphasis on previously unexplored independent factors such as independence, objectivity, and due professional care. Moreover, it introduces a mediating factor in the form of top management support. This study is conducted in Palestine, making it unique as it is the first of its kind to investigate the relationship between internal auditing and sustainable development achievement within the banking sector in this context.

2.2 Development Hypotheses: Based on Previous Studies and Agency Theory. The Following Hypotheses Were Formulated

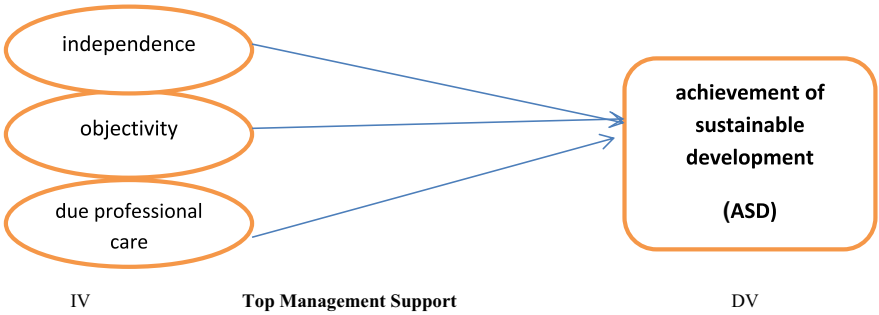
H1: "There is a positive impact of internal audit on the achievement of sustainable development in the banking industry".

The first hypothesis branches into the following hypotheses:

1. There is a positive influence of internal audit independence on the achievement of sustainable development in the banking industry.
2. There is a positive impact of the internal auditor's objectivity on the achievement of sustainable development in the banking industry.
3. There is a positive impact of due professional care on the achievement of sustainable development in the banking industry.

H2: "There is a positive impact of internal audit on the achievement of sustainable development in the banking industry, by mediating role of top management support".

3 Model of the Study



Control Variables: Environmental Internal Audit, Compliance Audit, Environmental Management System Auditing, Environmental Financial Auditing, Governance, Risk Management.

4 Theoretical Framework

Internal Auditing: "Internal auditing obtains an available, impartial assurance and consultation process intended to enhance an organization's performance. It contributes to the achievement of organizational goals by applying a methodical, disciplined approach to assessing and enhancing the efficacy of risk management, control, and governance systems Internal auditors provide assurance to the Board of Directors and executive management that the organization's internal controls are working effectively". They also help to identify weaknesses in these internal controls and provide recommendations for improving them, helping the organization to become more efficient and effective [20, 21].

Sustainability Development in Bank Industry: Sustainable development refers to development that is carried out in an environmentally responsible manner, focusing on expansion and promoting overall well-being within an ecologically sound framework. It involves implementing practices that go beyond financial, ecological, and social barriers and are aimed at meeting the needs of the present without jeopardizing the requirements of future generations. Sustainable development aims to achieve economic growth while considering social equality and environmental preservation. It emphasizes the satisfaction of human needs, social equality, and respect for environmental limits as the foundation for prioritizing economic issues [19].

Top Management Support: Management support refers to the actions and behaviors of senior management in an organization that demonstrate their commitment to and endorsement of a particular initiative, project, or process. In the context of internal audit, management support can take the form of providing resources, setting clear expectations, promoting a culture of accountability and transparency,

and actively engaging with auditors to ensure their independence and objectivity. Effective management support is essential for the success of internal audits, as it helps to create an environment in which auditors can perform their duties with confidence and effectiveness [15].

5 Methodology

5.1 Data Collection

"Data for the study was collected from primary sources using questionnaires as the primary research instrument. The questionnaire was developed based on previous research examining the relationship between internal auditing and sustainability". Additionally, "data were collected from secondary sources such as books, journals, and relevant online resources".

5.2 Population and Sample Study

The study's population comprises seven banking institutions that are publicly traded on the Palestine Stock Exchange. Specifically, the study's participants are internal auditors employed within these financial institutions. A simple random sampling method was employed to select 60 individuals out of a total of 78, representing 77% of the population. Subsequently, questionnaires were disseminated to these selected employees, all of which were accurately completed.

Table 1 illustrates that all the specimens consist of individuals working as staff members within the internal audit divisions, occupying different positions. These individuals have obtained specific academic credentials in the fields of finance and management and have acquired expertise in the domain of internal audit. Nonetheless, 73% lack official certifications in the field of auditing. Consequently, the group of subjects selected for this research is deemed to be a suitable representation of the original demographic.

5.3 Tool of the Study

In order to accomplish the research aims, data will be gathered through the utilization of a self-constructed questionnaire in English and Arabic (generated online via Google). Respondents were requested to provide responses to inquiries regarding the research and assess their hypotheses within the questionnaire. The questionnaire, which functioned as the main instrument for data collection in the study, comprised

Table 1 Description of the study sample

Factors	"Categories"	"Frequency"	"Percentage%"
Job title	"Director of the department"	6	10
	"Head of the department"	14	23
	Internal auditor	40	67
	Total	***60***	***100***
Educational background	Advanced degree	40	67
	Bachelor	20	33
	Intermediate diploma	0	0
	Total	***60***	***100***
Years of experience	Less than 5 years	6	10
	"5–15 years old"	34	57
	"More than 15 years"	20	33
	Total	***60***	***100***
Obtaining professional certification in auditing	Yes	16	27
	No	44	73
	Total	***60***	***100***

multiple sections outlining the study objectives and the anticipated responses from the participants. Moreover, a Likert scale methodology with five dimensions was employed to assess the comparative significance of each answer. Subsequently, the data underwent collection, input into a computer system, and underwent statistical analysis utilizing the SPSS software. The research was carried out during the initial quarter of 2024, covering the period from January 1, 2024, to March 31, 2024. The instrument was devised based on existing theoretical literature and prior investigations.

The questionnaire is the main research tool and consists of four parts:

The first section: "The demographic information of the study participants is outlined based on four criteria: position, academic background, years of experience, and professional certification in auditing".

The second section: "The measure of the impact of each (the internal audit's independence **(IND)**, objectivity **(OBJ)**, and Due professional care **(DPC)**) on achievement of sustainable development across (12) paragraphs gauge".

Third section: "It assesses the level of Top Management Support (TMS) for internal auditing practices in banks listed on the Palestine Exchange, spanning across six comprehensive paragraphs".

Fourth section: "The gauge of the grade of the achievement of sustainable development **(ASD)** in the banks registered on the Palestine exchange included (7) items to represent the gauge".

Answers between (1 and 5) on a five-point Likert scale are as follows:

1. Belief level (5). 2. Acceptance: Level (4). 3. Balance: Level (3). 4. Objection: Level (2). 5. Strongly inclined to level (1).

Therefore, the final form of the questionnaire (research instrument) consisted of 25 items on a 5-point Likert scale.

5.4 Data Examinations

5.4.1 "According to the descriptive statistics results: Use the following table to explain the results":

1. "Very good: Greater than 4.2, Very good: Greater than 3.4 but less than 4.2, Medium: Greater than 2.6 but less than 3.4, Low: Greater than 1.8 but less than 2.6, Very low: Below 1.8".

5.4.2 "According to the interpretation of the results, if the p-value is close to 5% and statistically significant, the hypothesis is accepted. Conversely, if the p-value exceeds 5% and is not statistically significant, the result is rejected".

5.5 The Reliability of the Study Tool

The Cronbach's Alpha test utilized in evaluating the questionnaire's internal consistency yielded a result of 0.95. Given that this value exceeds the 0.70 threshold, it suggests that the research instrument is reliable, and the data gathered is suitable for assessing variables, providing a dependable basis for conducting statistical analysis [22].

6 Statistical Analysis of Data

"A series of statistical methods were employed to analyze the data and test the hypotheses of the study. These methods include".

6.1 Data Analysis and Discussion

1. **Descriptive Statistics Measure**

The statistical examination of the study included applying frequency and percentage calculations to characterize the research participants, along with evaluating the data using mean and standard deviation to interpret the participants' answers. The demographic details of the study group were displayed in Table 1, while Table 2 outlined

the average values and the spread of the responses for the items on the survey that relate to the study's key themes. The analysis revealed that the average score for each section and component of the research exceeded 3, indicating their general acceptance. The standard deviation values, being under 1, reflected the responses' concentration and the credibility and acceptance of the data's distribution [23].

Table 3 **illustrates that:**

1. A review of the standard deviation ratios revealed a high degree of consistency among the opinions of the study participants. The percentage of agreement within the sample ranged from 85 to 90%, signifying a notable uniformity in their responses.
2. The effectiveness of internal audit practices, coupled with its independence, the objectivity of internal auditors, and the exercise of due professional care, significantly contribute to the attainment of sustainable development within the banking industry.
3. The level of support from top management for the internal audit activity in banks is high.
4. The level of achievement of sustainable development in banks is high.

2. **Inferential Statistics**

"The data analysis was conducted using the Statistical Program for Social Sciences (SPSS) as follows":

1. **Correlation Matrix**

"The correlation matrix in Table 3 demonstrates a significant positive relationship between the independent variables (the internal audit's independence, objectivity, and professional care), the mediator (Top Management Support), and the dependent variable (the achievement of sustainable development) at a significance level of 1%. This indicates a statistically significant and strong relationship. The researcher interprets this as internal audit playing a crucial and effective role in achieving sustainable development in the banking and Multiple Linear Regression analysis was employed to examine the effects of independent variables on the dependent variables in Palestine".

1. "Multiple Linear Regression test to test the effects of independent variables on the dependent variable" [24].

Table 4 details the outcomes of the statistical examination for the conceptual model of the study, incorporating an independent variable, internal audit, defined by attributes such as independence, objectivity, and due diligence, against a single dependent variable, reflecting the attainment of sustainability within banks listed on the Palestine Stock Exchange. A substantial correlation is evidenced by an R-value of 0.678, implying a strong link between the various aspects of internal auditing and the achievement of sustainable development in these banks. The results also demonstrate a significant influence of the internal audit on the achievement of sustainable development, with an F. Sig value of 0.00, which falls below the 0.05 threshold.

Table 2 The arithmetic mean and standard deviation of the questionnaire responses provided valuable insights into the participants' opinions

#	Paragraph	Mean	Std. deviation
Independent variable (internal audit)		*4.18*	*0.43*
Independence		*4.30*	*0.41*
1	"The internal audit department within the bank maintains functional independence from the executive management team"	4.26	0.52
2	"The director of the internal audit department confirms the organizational independence of internal audit activity to the board of directors on an annual basis at least"	4.13	0.56
3	"The director of the internal audit department within the bank functionally reports to the board of directors or the audit committee, ensuring a direct line of communication and accountability"	4.56	0.49
4	"The director of the internal audit department communicates directly with the board of directors"	4.33	0.54
5	"The selection and performance evaluation of the director of the internal audit department fall under the purview of the board of directors or the audit committee"	4.16	0.58
Objectivity		*4.17*	*0.48*
6	Internal auditors uphold their neutrality by refraining from any activities that could potentially compromise their impartial evaluation	4.10	0.60
7	The internal auditor discloses all known facts that, if not disclosed, could distort their reports on the activities being audited	4.23	0.49
8	The internal auditor rejects anything that could compromise their professional judgment	4.20	0.60
Due professional care		4.04	0.54
9	Employees in the internal audit department are enrolled in specialized professional courses	4	0.58
10	The internal auditor at the bank possesses communication, dialogue, and teamwork skills	4.06	0.63

(continued)

Table 2 (continued)

#	Paragraph	Mean	Std. deviation
11	The internal auditor at the bank is enhanced with knowledge of information technology	4	0.68
12	The internal auditor at the bank possesses reasonable experience in local financial systems and regulations	4.10	0.65
Top management support		*3.99*	*0.59*
13	The senior management at the bank provides sufficient support for internal audit in the field of sustainability	3.96	0.60
14	The senior management at the bank provides sufficient support for internal audit in the field of sustainability	4	0.58
15	Effective communication between the senior management of the bank and the internal audit department is maintained to align with the pursuit of sustainability goals	3.93	0.63
16	Senior management at the bank demonstrates a commitment to enhancing the skills of employees within the internal audit department, particularly in the domain of sustainability	4.03	0.60
17	The senior management at the bank is interested in utilizing the internal audit team and technology to monitor and evaluate key sustainability elements (environmental, social, governance)	4.03	0.60
18	Senior management at the bank values the recommendations of the internal audit team, focusing on enhancing the integration of sustainability principles with the financial objectives of the bank	4.03	0.59
Dependent variable (achievement of sustainable development)		*3.91*	*0.501*
19	Integrating environmental, social, and governance (ESG) topics into its operations with the aim of creating added value for stakeholders	3.9	0.60
20	The bank is committed to driving sustainable social development forward	3.9	0.60

(continued)

Table 2 (continued)

#	Paragraph	Mean	Std. deviation
21	The bank consistently engages with stakeholders (customers, shareholders, employees, etc.) to understand their needs and aspirations, which constitute the essence of sustainability goals, and strives to meet them	3.63	0.71
22	Developing, updating, and evaluating business continuity management plans and providing recommendations	4.03	0.48
23	Compliance with relevant legal and regulatory requirements related to achieving sustainable development	4.03	0.53
24	Ensuring that the risk management infrastructure is aligned with environmental, social, and economic changes	4	0.57
25	The bank is committed to integrating environmental, social, and governance (ESG) issues and managing them within the bank's governance framework	3.93	0.50

Table 3 Correlation matrix

Variables	ASD	IND	OBJ	DPC	TMS
ASD	1	0.535**	0.502**	0.775**	0.489**
IND	0.535**	1	0.768**	0.740**	0.535**
OBJ	0.502**	0.768**	1	0.693**	0.736
DPC	0.775**	0.740**	0.693**	1	0.670**
TMS	0.489**	0.666**	0.736**	0.775**	1

** The correlation is statistically significant at the 0.01 level, indicating a strong relationship between the variables

Moreover, the coefficient of determination, R2, stands at 0.460, indicating that the different dimensions of internal audit account for 46% of the variation in sustainable development.

"The coefficient of (t) between the independent and dependent variables is statistically significant at the one percent level, as presented in Table 4. This indicates that the mediation effect is both statistically significant and partial, resulting from the influence of the independent variable on the dependent variable. As shown in Table 4, the regression line equation may be utilized to describe the value of the internal auditing correlation coefficient with the support of top management":

Table 4 The multiple regression test

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	1.252	0.443	0.678	2.827	0.007
Internal auditing	0.779	0.111	0.335	7.023	0.000
Independence	0.640	0.133	0.502	4.816	0.000
Objectivity	0.523	0.118	0.775	4.424	0.000
Due professional care	0.713	0.076	0.624	9.330	0.000
Top management support	0.720	0.065		9.176	0.003

Factor	R	R square	F value	Sig
Internal auditing	67.8%	46%	49.319	0.000

[a] Dependent Factor: achievement of sustainable development
Significant at (0.05) $\geq \alpha^*$

ASD = 1.252 + 0.779Internal auditing + 0.640 Independence + 0.523 Objectivity + 0.713 due professional care + 0.720 Top management support + e.

6.2 Hypotheses Testing

"To test the theories, the researchers used basic linear regression analysis".

H1: There is a positive impact of internal audit on the achievement of sustainable development in the banking industry.

Table 5 illustrates a significant relationship between internal audit and the achievement of sustainable development within the banking industry, exhibiting a correlation coefficient of 67.8%. The independent variable accounts for 46% of the variance observed in the dependent variable, while 54% of the variance remains attributed to other factors. The statistical analysis validates the statistical significance of the relationship between these two variables, providing support for the acceptance of the alternative hypothesis.

1. There is a positive influence of internal audit independence on the achievement of sustainable development in the banking industry.

Table 5 demonstrates that there is a significant relationship between internal audit independence and the attainment of sustainable development within the banking industry, with a correlation coefficient of 53.5%. The independent factor accounts for 28.6% of the variance observed in the dependent factor. Moreover, 71.4% of the variance in the dependent factor is explained by other factors. The statistical analysis confirms that the relationship between these two factors is statistically significant, thus supporting the acceptance of the alternative hypothesis.

Table 5 Analyzing "the impact of internal auditing on the achievement of sustainable development" using simple linear regression

Factor	R (%)	R square (%)	F value	Sig
Internal auditing	67.8	46	49.319	0.000
Internal audit independence	53.5	28.6	23.199	0.000
Internal audit objectivity	50.2	25.2	19.571	0.000
Due professional care	77.5	60	87.054	0.000
Internal auditing, top management support	67.9	46.1	24.415	0.000

The researchers argue that the independence of internal auditing is a crucial element in achieving sustainable development in the banking industry, as it contributes to building trust, improving management and operations, addressing risks, and enhancing transparency and accountability.

2. There is a positive impact of the internal auditor's objectivity on the achievement of sustainable development in the banking industry.

Table 5 illustrates a "significant relationship between internal audit objectivity and the achievement of sustainable development" within the banking industry, exhibiting a correlation coefficient of 50.2%. The independent variable accounts for 25.2% of the variance observed in the dependent variable, while 74.8% of the variance is attributed to other factors. The statistical analysis validates the statistical significance of the relationship between these two variables, providing support for the acceptance of the alternative hypothesis.

The researchers emphasize the pivotal role of internal auditor objectivity in driving sustainable development within the banking industry. By upholding objectivity, internal auditors build trust, facilitate sound decision-making, enhance internal processes, and ensure compliance with regulations.

3. There is a positive impact of due professional care on the achievement of sustainable development in the banking industry.

Table 5 illustrates a strong relationship between due professional care and the achievement of sustainable development within the banking industry, exhibiting a correlation coefficient of 77.5%. The independent variable accounts for a substantial 60% of the variance observed in the dependent variable, while the remaining 40% of the variance is influenced by other factors. The statistical analysis validates the statistical significance of the relationship between these variables, providing support for the acceptance of the alternative hypothesis.

The researchers emphasize the critical role of internal auditor professionalism in driving sustainable development within the banking sector. By exhibiting professionalism, internal auditors deliver quality reports, mitigate risks, ensure compliance with legal standards, and bolster the reputation of the organization, thereby contributing to its long-term sustainability.

H2: There is a positive impact of internal audit on the achievement of sustainable development in the banking industry, by mediating role of top management support.

Table 5 illustrates that in the presence of the mediating factor, top management support, "the relationship between internal audit and the achievement of sustainable development is 67.9%. The independent factor accounts for 46.1% of the variance observed in the dependent factor, while 53.9% of the changes are attributed to other factors. Furthermore", the statistical analysis confirms a significant relationship between these factors, thus supporting the acceptance of the alternative hypothesis.

7 Conclusion and Recommendation

"The study revealed that internal auditing has a positive impact on achieving sustainable development in the banking industry". It also indicated a significant influence of the internal audit's independence, objectivity, and professional care on achieving sustainable development in the banking industry. This implies that internal auditing represents a vital element in supporting and enhancing sustainable development in the banking industry through improving governance, risk management, supporting strategic decisions, and enhancing financial and operational performance in a manner that considers environmental, social, and governance dimensions. The results align with the findings of previous studies [9, 11, 13–15, 25, 26].

Based on this finding, Bank boards should enhance the role of the internal auditing department in reviewing sustainable development initiatives, it is also recommended. There is a necessity to heighten the focus on internal audit activities and enhance their effectiveness to ensure independence, objectivity, efficiency, and effectiveness. This is crucial due to the positive impact internal audit has on supporting sustainable development, and it is imperative to persist in improving the expertise and knowledge of internal auditors by expanding and diversifying training programs focused on sustainable development in banks. This will equip them with updated skills in these areas. Finally, the study underscores the importance of supporting the Monetary Authority's efforts to assist internal audit departments in adopting a standardized approach and adhering to relevant standards. This, in turn, elevates the role and contributions of internal auditing within Palestinian banks.

"The study significantly enhances both theoretical and empirical understanding of how internal auditing activities impact the effective management of sustainable development in banks across Palestine and other countries. The study's findings could assist in enhancing the preparedness of bank professionals and auditors to grasp the principles and components of internal auditing activity and its efficacy", and "to implement these principles within their respective banks. Internal auditing activities, structures, and sustainable development should be carefully integrated into the development of strategies for Palestinian banks", recognizing their significance as crucial drivers of bank value. Enhancing the strategy development process can involve fully integrating management practices along with their corresponding indicators.

Palestinian banks can enhance their performance by aligning various perspectives, internal auditing principles, and sustainable development, and by assigning ratings to each of these perspectives. These findings also have significant implications for investors and asset managers.

However, "it's important to acknowledge that this study may have certain limitations, and its results should be interpreted within those limitations. The findings are based on a cross-sectional survey conducted in one country", which means that extending the survey to different time periods and countries might lead to nuanced changes in the results. Additionally, a certain body of literature may have influenced the choice of influencing elements in the model, while other literature may have suggested alternative variables worth looking into. Respondents may have been tempted to downplay or remain neutral on some items they thought sensitive or confidential, even in spite of efforts to increase response rates.

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Unveiling the Dynamics of Business Intelligence: Definition, Components, Tools, and Data Mining



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Abstract The paper "Unveiling the Dynamics of Business Intelligence: Definition, Components, Tools, and Data Mining" discusses the diverse world of business intelligence (BI) and provides a thorough examination of its essential features. The paper begins by clarifying the definition of BI and providing an expanded understanding of its conceptual foundation. The paper then dissects the components of an effective BI system, highlighting their interdependence and contributions to organizational decision-making processes. A significant portion of this article is dedicated to an in-depth analysis of the tools employed in BI implementation. The authors evaluate various BI tools, ranging from normal reporting and analytics solutions to emerging technologies, highlighting their functionalities and suitability for diverse business needs. The paper explores how business intelligence (BI) dynamics are changing in response to changes in the business landscape and technological advancements. To improve BI capabilities, the authors stress the significance of flexibility and the incorporation of cutting-edge technologies. The information provided in this paper helps researchers, practitioners, and decision-makers understand business intelligence (BI) and offers helpful insights for navigating the ever-evolving and challenging field of BI.

Keywords Business intelligence · Analytical tools · Machine learning · Data mining

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1 Introduction

1.1 Overview of Business Intelligence

Business intelligence systems combine operational data with analytical tools to present complex and competitive information to planners and decision makers. The objective is to improve the timeliness and quality of inputs to the decision process [1].

Business Intelligence is used to understand the capabilities available in the firm; the state of the art, trends, and future directions in the markets, the technologies, and the regulatory environment in which the firm competes; and the actions of competitors and the implications of these actions [2].

The emergence of the data warehouse as a repository, advances in data cleansing, increased capabilities of hardware and software, and the emergence of the web architecture all combine to create a richer business intelligence environment than was available [3]. Although business intelligence systems are widely used in industry, research about them is limited.

This paper, in addition to being a tutorial, proposes a BI framework and potential research topics. The framework highlights the importance of unstructured data and discusses the need to develop BI tools for its acquisition, integration, cleanup, search, analysis, and delivery. In addition, this paper explores a matrix for BI data types (structured vs. unstructured) and data sources (internal and external) to guide research [4].

1.2 Scope and Objectives of the Paper

The scope includes a variety of topics, including the use of business intelligence to understand corporate capabilities, market trends, technical breakthroughs, regulatory settings, and competitor actions. The debate also covers the evolution of the business intelligence environment as a result of data warehousing, data cleansing, technology advancements, and the impact of web architecture.

The objectives of this study are to highlight the purpose of business intelligence. Communicate that the major goal of business intelligence systems is to increase the timeliness and quality of decision-making by combining operational data and analytical tools. Components, Tools, and Data Mining.

1.3 Historical Development of Business Intelligence

The Historical Development of Business Intelligence examines the evolution of a critical field that has revolutionized how firms make informed decisions see Table 1,

From its humble beginnings in simple reporting systems to the complex analytics and data-driven insights of today, this trip through time highlights the important milestones and technological developments that have influenced the landscape of business intelligence [5].

1.3.1 Milestones and Technological Advancements

Technological developments have a significant impact on how businesses use data to make informed decisions in the dynamic field of business intelligence.

Here are some noteworthy developments and trends in business intelligence (BI) that occurred prior to then. Remember that the field is always changing, thus further advancements might have occurred since then [6].

2 Components of Business Intelligence

BI systems typically consist of several key components that work together to collect, process, analyze, and present data [7] and (Lloyd & Corporation, 2011).

These components include:

Data Sources: BI begins with data. Data can be collected from a variety of sources, including databases, spreadsheets, external sources, and web services. These sources might be either structured (relational databases) or unstructured (social media data).

Data Extraction: This component is in charge of extracting data from multiple sources, converting it into a usable format, and loading it into a data warehouse or data mart.

Data Warehouse/Data Mart: Data warehouses or data marts are databases designed to store and manage huge amounts of structured data. They are ideal for querying and reporting, making them an essential component of BI systems.

Data Modeling: Data modeling involves designing the structure and relationships of the data warehouse. Typically, this entails building tables relationships, and metadata to make querying and reporting more efficient.

Data Analytics and Processing: where data is evaluated using a variety of approaches, including statistical analysis, data mining, and machine learning, to identify insights and trends. OLAP (Online Analytical Processing) is commonly used for multidimensional analysis and Advanced BI systems may use predictive analytics and machine learning to determine future patterns and outcomes based on past data [8] (Fig. 1).

Reporting and Dashboards: BI solutions offer a variety of data visualization options, including as reports, charts, graphs, and dashboards. These technologies help users understand and interact with data.

Table 1 Development of business intelligence

Time duration	Evolution	Description
2010–2015	Traditional BI to modern BI transition	Replace static, report-focused business intelligence with more engaging, user-friendly dashboards and self-service analytics The emergence of cloud-based BI tools, which facilitate collaboration, scalability, and simpler access
2015–2017	Rise of data discovery tools	Growing acceptance of data exploration and visualization platforms like Tableau, Power BI, and Qlik, which let users examine and evaluate data in an easy way
2016–2022	Mobile BI adoption	Increasing demand for mobile business intelligence (BI) solutions that enable users to get vital business insights while on the road
2018–2020	Integration of AI and machine learning	BI solutions are being enhanced with AI and machine learning features to enable automated insights, predictive analytics, and more intelligent decision-making
2020–2021	Focus on data governance and compliance	An increasing focus on data governance is necessary to guarantee data security, quality, and compliance with laws like the CCPA and GDPR
2020–2023	Advancements in natural language processing (NLP)	NLP integration with business intelligence (BI) solutions enables users to engage with data using natural language queries and obtain insightful information
2017–2023	Data democratization	Continued efforts to make data accessible to non-technical users, enabling a wider range of employees to make data-driven decisions
2018–2023	Real-time analytics	Growing demand for real-time analytics skills to help companies respond quickly to shifting market dynamics
2021–2023	Focus on augmented analytics	Increased use of augmented analytics, which automates data preparation, insight discovery, and sharing by utilizing AI and machine learning
2022–2023	Enhanced data collaboration	BI solutions include enhanced collaboration tools that make it easier for teams to work together and share information about data findings
2015–2023	Continuous evolution of cloud BI	Cloud-based BI solutions are gaining popularity due to their ease of scaling, affordability, and accessibility. However, the industry is expected to evolve as technology advances and business demands change

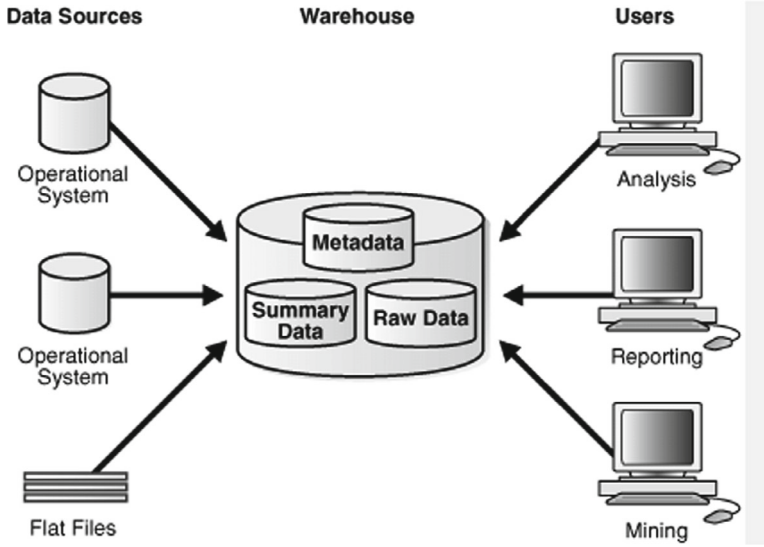


Fig. 1 Components of business intelligence

Business Intelligence Server: The BI server manages user access, security, and dashboard dissemination. It guarantees that authorized users have access to the correct data.

Data Governance and Security: Data governance policies and security procedures are critical for protecting sensitive data, ensuring data quality, and complying with requirements.

Collaboration and Sharing: BI systems frequently contain collaboration tools that allow users to share reports, insights, and notes with colleagues, encouraging collaborative decision-making.

These elements form a comprehensive business intelligence system that helps firms collect, process, and present data in order to support data-driven decision-making. Depending on the needs and technological stack of the company, different parts and tools may be utilized [9].

3 Business Intelligence Tools

3.1 Overview of BI Tools

Business Intelligence (BI) tools are software applications and technologies used by organizations to collect, analyze, and present business data, transforming raw data into valuable insights for decision-making [4, 10].

Reporting Tools: Reporting tools focus on creating and presenting static or interactive reports based on historical data like Crystal Reports, Tableau, Microsoft Power BI, JasperReports.

Dashboards: Dashboards provide a visual overview of key performance indicators (KPIs) and metrics, often in real-time, to facilitate quick decision-making.

Examples: Tableau, Microsoft Power BI, QlikView, Domo.

Data Visualization Tools: tools help in creating visual representations of data, making it easier to understand complex patterns and trends.

Examples: Tableau, Microsoft Power BI, QlikView, D3.js.

OLAP (Online Analytical Processing) Tools: OLAP tools enable users to interactively analyze multidimensional data for better insights and decision-making for example Microsoft SQL Server Analysis Services, IBM Cognos, Palo OLAP.

ETL (Extract, Transform, Load) Tools

ETL tools assist in extracting data from various sources, transforming it into a usable format, and loading it into a data warehouse for analysis for example Informatica PowerCenter, Talend, Microsoft SQL Server Integration Services (SSIS).

Data Warehousing Tools

Data warehousing tools help in the efficient storage and retrieval of large volumes of structured data for analysis for example Amazon Redshift, Snowflake, Google BigQuery.

Data Discovery Tools

Data discovery tools focus on exploring and analyzing data to uncover patterns and insights without predefined queries for example QlikView, Tableau, Spotfire.

Predictive Analytics Tools

Predictive analytics tools use statistical algorithms and machine learning techniques to forecast future trends and outcomes based on historical data for example IBM SPSS, RapidMiner, SAS Predictive Analytics.

Collaborative BI Tools

Collaborative BI tools promote teamwork by facilitating the sharing of insights, reports, and dashboards among team members for example Microsoft Power BI, Tableau, Domo.

Mobile BI Tools: Mobile BI tools enable users to access and interact with business intelligence content on mobile devices for examples MicroStrategy Mobile, Tableau Mobile, Microsoft Power BI Mobile.

BI tools, often overlapping, offer a range of functionalities, with the choice based on business needs, data volume, variety, and desired analytical capabilities.

3.2 Selection Criteria for BI Tools

Factors influencing tool selection Several factors influence the selection of Business Intelligence (BI) tools, as organizations seek solutions that align with their specific needs, infrastructure, and goals. Here are key factors that influence BI tool selection [11].

Business Requirements and Objectives: The tool's ability to address specific business needs and objectives, such as improving sales, enhancing operational efficiency, or optimizing marketing strategies.

Usability and User Adoption

Ease of Use and Availability of training resources and support to facilitate user adoption.

Data Integration and Compatibility: Compatibility with existing data sources and the ability to integrate with various data formats and Capability to handle growing data volumes and adapt to changing business needs.

Functionality and Features: Range of analytical functions such as reporting, dashboards, ad-hoc querying, predictive analytics, and data visualization.

Performance and Speed: Ability to process and retrieve data in real-time or near real-time for timely decision-making.

Security and Compliance: Robust security features to protect sensitive data and comply with industry regulations (e.g., GDPR, HIPAA) and Alignment with industry-specific compliance standards and data governance requirements.

Vendor Reliability and Support: Assessing the vendor's track record, reliability, ongoing support services and Understanding the vendor's future plans for product development and upgrades.

Interoperability and Integration: Compatibility with Existing Systems and Availability of APIs to customize or extend functionality as needed.

User Feedback and Recommendations: User Reviews and Case and organizations can make informed decisions that best suit their BI requirements and contribute to achieving their business objectives.

4 Data Mining in Business Intelligence

Finding patterns, trends, correlations, or important information in huge databases is a technique known as data mining [12]. It entails analyzing and interpreting data using a variety of methods including database administration, machine learning, and statistics. Finding hidden links in the data and extracting insightful knowledge that might help with forecasting, decision-making, and other processes are the main objectives of data mining [13].

4.1 Applications of Data Mining in BI

Data mining plays a crucial role in enhancing Business Intelligence (BI) by extracting valuable patterns, trends, and insights from large datasets. Here are several key applications of data mining in BI: [14].

Predictive Analytics: Predictive analytics determines the probability of future events by Utilizing statistical algorithms and historical data. Data mining can be used to create predictive models that predict customer behavior, trends, and business performance. This supports organizations in developing proactive plans and well-informed judgments [12].

Customer Segmentation: Customers can be divided into groups according to their traits, preferences, and behaviors through data mining. Customer segments can be used by BI systems to optimize product suggestions, enhance customer experiences, and personalize promotions [15].

Anomaly Detection: Detecting anomalies in data, locating odd trends or outliers.

Through the detection of abnormalities in financial transactions, network activity, or business operations, data mining enables firms to recognize and handle possible problems or fraud.

Text Mining and Sentiment Analysis: Extracting information from unstructured text data, such as customer reviews, social media comments, and support tickets. Integrating text mining into BI systems allows businesses to better analyze customer sentiment, identify developing concerns, and improve overall brand reputation [8].

Sales and Revenue Forecasting: Using historical sales data to forecast future sales and revenue. Data mining techniques help firms plan inventories, allocate resources, and budget by generating accurate sales and revenue forecasts [10].

Pattern Recognition: Finding repeating patterns in data. BI systems use pattern recognition to detect trends, anomalies, and hidden connections in datasets, allowing for more informed strategic decisions [14].

Campaign Effectiveness Analysis: Evaluate the impact and success of marketing activities. By evaluating campaign-related data, BI systems may assess the efficiency of marketing initiatives, allowing firms to fine-tune their tactics for future campaigns [16].

5 Case Study and Practical Example in Business Intelligence

Business intelligence (BI) in healthcare involves utilizing data analytics and reporting tools to transform unstructured data into valuable insights for healthcare practitioners. Here, the objectives and aims must be achieved [17].

Patient Care Optimization: BI tools can enhance patient care by analyzing hospital readmission rates, identifying common variables, and implementing initiatives to improve outcomes and reduce costs [18].

Operational Efficiency: BI enhances hospital and clinic efficiency by analyzing patient flow, appointment scheduling, and resource consumption data, thereby reducing wait times and optimizing staffing levels.

Financial Management: Business intelligence (BI) can enhance healthcare firms' financial management by providing insights into revenue cycle management, billing, and claims processing, thereby reducing billing errors and ensuring prompt reimbursements [19].

Clinical Decision Support: By offering data-driven insights that facilitate clinical decision-making, BI systems can help physicians. For instance, BI technologies can assist in predicting patient outcomes, identifying the best treatments for particular illnesses, and customizing patient care plans by analyzing massive datasets from electronic health records (EHRs).

Population Health Management: BI aids in evaluating health data from various sources, improving health outcomes and reducing healthcare inequities, enabling public health officials and healthcare professionals to develop targeted interventions [20].

Predictive Analytics: Healthcare practitioners can utilize predictive analytics and BI technologies to anticipate future trends, preparing hospitals for high demand periods by forecasting patient admission rates and ensuring resource accessibility.

5.1 Case Study: Reducing Hospital Readmissions

A hospital used a business intelligence tool to analyze patient data and identify readmission reasons, revealing that patients often neglected post-discharge instructions, highlighting gaps in patient education.

The hospital implemented specialized teaching programs for high-risk patients, leading to a 15% decrease in readmission rates within six months, improving patient outcomes and reducing costs.

Business intelligence (BI) can significantly enhance patient care, operational efficiency, financial management, compliance, and overall healthcare provision in the healthcare sector [18].

5.2 Practical Example: Reducing Emergency Department (ED) Wait Times

- **Problem**

A large urban hospital faces significant challenges with long wait times in its Emergency Department (ED), leading to patient dissatisfaction and potential negative impacts on patient outcomes. The hospital needs to identify the root causes of these delays and implement strategies to improve the efficiency of ED operations [19].

- **Solution**

Clean, consistent, and up-to-date data is ensured by the BI tool, which unifies data from all sources into a single data warehouse, here are the methods to manipulate data in BI health care system:

1. **Data Collection**

The hospital gathered data from various sources like patient logs, staff schedules, EHRs, and patient surveys to gather data on staff availability, demographics, and time stamps during ED visits.

2. **Data Integration**

The BI tool combines data from various sources into a centralized data warehouse, ensuring its cleanliness, consistency, and up-to-datedness.

3. **Data Analysis**

   - **Descriptive Analytics**: The BI tool generates reports and dashboards outlining key metrics such as average wait times, treatment times, and patient flow patterns [13].
   - **Diagnostic Analytics**: The hospital employs data analysis to identify bottlenecks like delays in triage and treatment initiation, and the correlation between staffing levels and wait times.

- **Predictive Analytics:** The hospital utilizes predictive analytics to anticipate ED demand by analyzing historical data and external factors like seasonal trends and local events.

5.3 Visualization

The BI tool helps identify peak hours, busiest days, and parts of the ED that experience frequent delays by providing visualizations such as heat maps and time-series graphs.

5.4 Decision Support System

BI tools used to leverage a combination of medical knowledge, patient data, and advanced analytical tools to provide recommendations, reminders, and insights that improve patient care and operational efficiency.

The hospital uses BI tool insights to adjust staffing schedules and allocate more resources to the triage area for faster initial assessments during peak times.

The hospital is enhancing its processes by implementing efficient triage protocols and fast-track systems for minor injuries to decrease wait times.

The BI tool continuously monitors ED performance, providing real-time alerts if wait times exceed acceptable thresholds, enabling the hospital to refine strategies and make data-driven adjustments [4].

5.5 Benefits and Outcomes

The hospital utilizes a BI solution to improve patient outcomes and operational efficiency by utilizing data analysis and visualization to generate valuable insights.

- **Reduced Wait Times**: Within six months, the average wait time in the ED is reduced by 30%.
- **Improved Patient Satisfaction**: When wait times are reduced and patients receive care more quickly, patient satisfaction rates rise.
- **Enhanced Operational Efficiency**: The hospital ensures efficient use of resources by improving staff and facilities [17].

6 Future Trends in Business Intelligence

However, based on existing trends and emerging technologies, here are some potential future trends in business intelligence [21] see (Fig. 2).

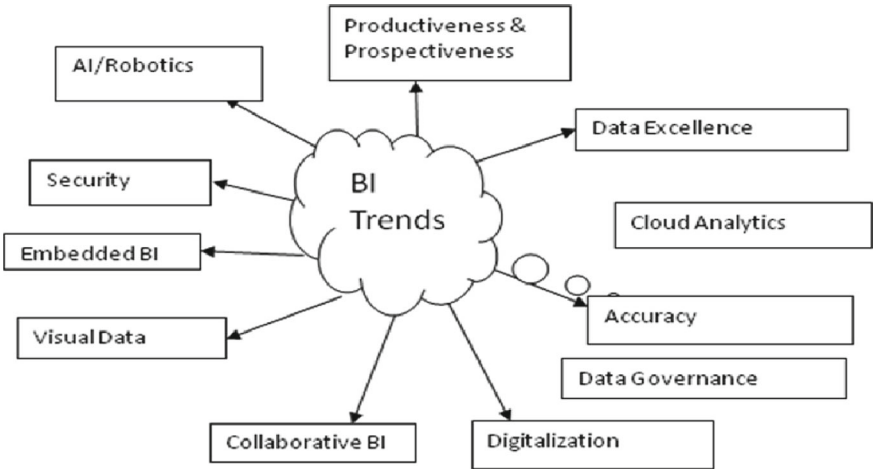


Fig. 2 Business intelligence future trends

Augmented Analytics Artificial intelligence (AI) and machine learning (ML) will be increasingly integrated into business intelligence (BI) systems. Augmented analytics can automate data preparation, insight discovery, and data visualization, allowing non-technical users to gain significant insights [12].

Natural Language Processing (NLP): BI tools are probably going to have more sophisticated natural language processing features. This makes analytics more approachable for a wider range of people by enabling them to engage with data using natural language inquiries [14].

Data Democratization: The trend toward making data accessible to a wider range of users within an organization is expected to continue. Self-service BI tools will empower business users to generate their own reports and insights without heavy reliance on IT departments.

Real-time Analytics: Real-time data analysis and reporting will become more and more in demand. Companies want to base their decisions on the most recent data, so real-time data processing and analytics must be supported by BI technologies.

Cloud-Based BI: Since cloud-based BI solutions are more affordable, flexible, and scalable, they should become increasingly popular. As a result, businesses can simply grow their BI infrastructure to meet their evolving needs.

Mobile BI: Mobile business intelligence will continue to grow in popularity, providing customers with on-the-go access to critical information and insights. Because they are not constantly limited to their workstations, executives and decision-makers will want mobile-friendly BI interfaces and tools.

Integration with Other Business Systems: BI tools will likely become more integrated with other business applications, such as customer relationship management

(CRM) and enterprise resource planning (ERP) systems. This integration can provide a holistic view of business operations [15].

It's essential to stay updated on industry developments to understand how these trends evolve over time.

7 Limitations and Constraints

Business intelligence has several limitations and constraints that organizations should be aware of [22].

Data Quality: BI projects require data quality assurance through data validation, cleansing, and governance procedures to optimize benefits and promote well-informed decision-making. Inconsistent data quality can lead to inconsistencies, wasting time and resources [3].

Integration Issues: Data consistency and reliability problems might arise when combining disparate data sources and systems into a single BI platform.

Cost: Employing and sustaining a BI system can be expensive, especially for small and medium-sized businesses. Costs can include software, hardware, training, and continuing support.

Complexity: BI systems can be complex, needing knowledge to set up, maintain, and analyze data effectively. Users may need training to fully utilize the system [23].

Security Concerns: Storing and analyzing sensitive business data in a BI system can create security risks if not properly protected.

Scalability: As businesses grow and data volumes increase, BI systems need to scale accordingly. Ensuring that the system can handle increasing amounts of data and users is essential for long-term success [24].

Organizational Culture and Change Management

Employees and management may resist adopting new BI systems and processes due to comfort with existing methods or fear of the unknown. Ensuring widespread adoption of BI tools across the organization requires effective change management strategies and demonstrating the value of BI [25].

Keeping Up with Technological Advancements: New tools and technologies are always developing, causing the BI landscape to change quickly. Staying up to date with these changes necessitates ongoing education and adjustment [26].

Integration of Emerging Technologies: While integrating AI, machine learning, and big data analytics into business intelligence (BI) systems can be challenging, doing so is essential to maintaining a competitive edge [3–5].

Understanding these limitations and constraints can help organizations make informed decisions when implementing and using business intelligence solutions [26].

8 Conclusion

This paper's primary objective was to provide a general overview of the field of business intelligence by presenting a range of elements that are used in enterprise theories and practices. Furthermore, we've included sections on various and unique BI applications, BI features, leading technologies used, particular trends, concerns, and challenges that BI will face in the future. Since BI theories, technology, and practices are so vast and complex, we have limited the number of BI components we will discuss in this paper to just a few.

As a last point of conclusion, business intelligence (BI) is becoming more and more common in a variety of areas. Generally speaking, enterprises should take into account a number of important criteria when obtaining and implementing BI, including BI empowerment through organization, flexibility, and integration.

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Mobile Payment Adoption: Challenges and Opportunities



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Abstract The rapid progression of technology has significantly impacted various aspects of human life, including the financial sector. The objective of this research is to explore the factors that influence the enactment of mobile payment systems, with a particular emphasis on the Palestinian setting. It is crucial to comprehend these factors in order to implement and utilize these technologies effectively. The adoption rates in Palestine, obstacles and challenges, and strategies to promote technology acceptance were all analyzed. Through an analysis of previous scholarly investigations and empirical studies, this article provides substantial insights into the present condition of technology adoption as it pertains to mobile payments in Palestine. According to the conclusion of the report, the adoption of mobile payments is reliant on variables including mitigate security risks, promote standardization, strengthen merchant acceptance, enhance infrastructure, and foster consumer confidence. These conclusions may provide valuable insights for policymakers, financial institutions, and researchers with respect to the formation of future developments.

Keywords Mobile payment · Palestine · Financial inclusion

1 Introduction

Continuous technological advancements in information and communications technology are transforming every aspect of our daily lives. The adoption of electronic methods has emerged as a critical requirement for governmental, educational, and commercial institutions [1, 2]. Particularly in financial operations, this transition provides numerous advantages, including improved service delivery, time savings, and streamlined transactions. Palestine, like numerous other nations, has been profoundly affected by the Internet and its intelligent applications because their widespread adoption [3]. Electronic payments have become an intrinsic component

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of daily existence, materializing in diverse formats including mobile phone-based payment systems, digital cash, digital checks, and digital wallets [4]. Due to the pervasive availability of mobile data and internet services and the exponential growth of mobile network subscribers, mobile payment (MP) systems have attracted significant interest from both industry professionals and academic researchers. This mode of payment is widely praised for its numerous benefits, which include enhanced efficiency, reduced time and costs, improved security and confidentiality, and accelerated transaction processing [5]. Notwithstanding their considerable potential, numerous MP services that have been implemented in Palestine recently, have failed to attain the expected level of widespread adoption [6]. Therefore, it is critical that MP service providers, such as financial institutions and mobile network operators, acquire a thorough comprehension of the determinants that impact consumers' inclination to adopt MP services in order to overcome the obstacles of adoption to this service.

Mobile money has become an accepted and dependable method for facilitating convenient and secure financial transactions worldwide. There is a growing appeal to the idea of replacing conventional paper currency with phone-based transactions that are more streamlined and convenient [7]. Mobile money has revolutionized financial management in numerous ways, including the ability to make online purchases, conduct international transfers, and pay bills with ease [8]. Maintaining this progress requires the integration of motivational elements, including cashback rewards, loyalty points, and discounts, in conjunction with an intuitive and user-centric interface, in order to guarantee that mobile money continues to be the favored option among consumers [8].

The objective of this research is to fill this void through investigating the possible factors that influence consumer behavior regarding the adoption of MP in Palestine. The increasing adoption of MP technology and digital banking signifies a developing pattern in modern society, which is transforming conventional cash-based economies into cashless ones [9]. The proliferation of smartphones and the expanding availability of internet connectivity have contributed significantly to the increased prominence of MPs in recent times. As a result, the primary objective of this study is to investigate a critical question: To what extent are MP technology and digital banking favored in Palestine?

We conducted a review of available data and pertinent literature on MP. We meticulously analyzed and categorized the collected information under relevant thematic headings to facilitate an informed decision-making process. By providing a robust conceptual framework, this study contributes to the existing body of knowledge on this subject, offering insights that are pertinent to both academia and industry stakeholders. Given the novelty of the topic, this study aspires to yield practical and meaningful outcomes and recommendations for MP users. Evidence of this study is of particular importance given the distinct circumstances prevailing in Palestine [10–12]. Palestine is an underdeveloped and politically unstable country [13–16]. However, Palestine has many similarities with many countries, especially in culture [17–19], implying the possibility of benefiting from the results of this study in other countries.

2 What is Mobile Payment?

Mobile payment processes signify a substantial progression in security when contrasted with conventional payment methods. By implementing biometric authentication methods, such as fingerprint or facial recognition, and Near Field Communication (NFC), it is possible to restrict transaction initiation and completion to authorized users only [20]. Moreover, to ensure the security of sensitive data, these applications implement encryption, thereby establishing an extra barrier against potential intruders who may attempt to intercept personal information with malicious intent. Leong [21] asserts that the capability to promptly identify, immobilize, or remotely erase a misplaced or stolen smartphone, in addition to ascertaining its whereabouts, enhances security protocols and effectively mitigates the hazards linked to fraudulent undertakings.

In regions that were previously underserved by conventional banks, MPs have emerged as disruptive forces that have reshaped the financial landscape. These platforms function as digital gateways, allowing users to link their mobile wallets to bank accounts or prepaid cards. This provides access to the digital economy to individuals who do not have traditional bank accounts [6]. This transformation has been exemplified in sub-Saharan Africa, where millions of individuals are now able to send, receive, and save money with the tap of a smartphone. In essence, this has transformed mobile devices into miniature banks and promoted financial empowerment [22].

In addition to facilitating transactions, MP applications have undergone significant development to integrate diverse daily life functions, including ticket reservations and food delivery, into a unified interface. By virtue of this seamless integration, both efficiency and the overall user experience are elevated [23]. It is impossible to ignore the success of MPs when analyzing this phenomenon. Societies have experienced a near-total transition away from cash, with platforms such as Alipay and WeChat Pay influencing all aspects of daily existence, from street vendors to upscale retailers. The extensive implementation of Quick Response (QR) codes has enabled this revolution, permitting even the most modest enterprises to effortlessly process MPs without investing in expensive point-of-sale systems [24].

Financial transactions have been significantly transformed by the advent of MP, which provides unprecedented convenience, enhanced security, and expanded financial inclusion. Ongoing technological progress is expected to facilitate the increased adoption of MP processes, thereby accelerating the progression towards a fully cashless society [25].

3 Mobile Payment in Palestine

These international developments did not result in Palestine's exclusion. Since 2020, MP providers have been operational in Palestine. As shown in Table 1, five companies have introduced MP services. Technological leadership, customers' consideration of online personalization and privacy, customers' inclination towards technology adoption, and e-trust and loyalty all impact the utilization of MP in Palestine [26]. In Palestine, the intention to use electronic wallets was found to be influenced by innovation characteristics, ease of use, and social influence, according to Altarturi [27]. Conversely, Mujahed [28] posits that the business model and enabling environment of Palestinian SMEs are the primary determinants of their adoption of MP. As stated by Ibrahim [29], the significance of MP has grown due to its favorable impacts on businesses and clients, its broad adoption, particularly among younger customers, and its versatility across various domains. The findings of the study shed light on the significance of promoting its usage through cultural shifts and an emphasis on its benefits. One of the advantages of MP adoption in Palestine is the expansion of financial inclusion [8].

In 2021, the number of registered mobile accounts was 227,040, of which only 30,097 are active accounts (Table 2). The number of registered agent outlets was 3419, all of which were active. On the other hand, the number of MP transactions is 699,080, worth 55,305,663 USD. As seen also in Table 2, the outstanding balances of mobile accounts was 1,150,879 USD of which 739,358 USD related to active accounts.

Additionally, Table 3 illustrates the narrow usage of MP within the Palestinian context. Though 84.16 percent of Palestinians own a mobile phone, only 2.33 percent have a mobile money account. The majority of the remaining percentages displayed in the table are a combination of mobile money and mobile banking results; therefore, the comparatively high percentages cannot be attributed to mobile money exclusively. These modest applications of MP underscore the significance of comprehending the obstacles that MP encounters in Palestine and devising strategies to surmount them.

Notwithstanding the manifold benefits of MP, strict adherence to optimal methodologies is critical for guaranteeing secure and efficient transactions. Adopting MP introduces inherent security vulnerabilities, such as the potential for unauthorized access or interception of wirelessly transmitted sensitive financial data. In order to

Table 1 Mobile payment providers in Palestine

Payment Company Name	Commercial Name
Middle East Payment Service	MEPS
The National Electronic Payment Company	JAWWAL PAY
Madfooatcom for Electronic Payment	MADFOOATCOM
Maalchat For Electronic Payment Services Limited liability Co	MAALCHAT
PalPay For Electronic Payment Systems Company	PALPAY

Table 2 Mobile wallets indicators in Palestine

Mobile money (mobile wallets) indicator	Total number/value in USD	
	2020	2021
Number of registered mobile money accounts	75,523	227,040
Number of active mobile money accounts	2219	30,097
Number of registered agents	2508	3419
Number of active agents	2506	3419
Value of mobile transactions	6,866,768	55,305,663
Number of mobile transactions	122,575	699,080
Outstanding balances of active accounts	207,267	739,358
Outstanding balances of all accounts	270,942	1,150,879

Source Palestinian Monetary Authority

Table 3 Usage indicators of mobile money and mobile applications of banks in Palestine

Indicator	2021 (%)
Made a digital in-store merchant payment: using a mobile phone (% age 15+)	3.51
Made a utility payment: using a mobile phone (% age 15+)	0.74
Made a utility payment: using a mobile phone (% who paid utility bills, age 15+)	3.07
Mobile money account (% age 15+)	2.33
Own a mobile phone (% age 15+)	84.16
Received government payments: through a mobile phone (% age 15+)	0.54
Saved money using a mobile money account (% age 15+)	0.55
Store money using a financial institution or a mobile money account (% age 15+)	10.77
Use a mobile phone or the internet to make payments, buy things, or to send or receive money using a financial institution account (% age 15+)	3.24
Use a mobile phone or the internet to make payments, buy things, or to send or receive money using a financial institution account (% with a financial institution account, age 15+)	9.77
Used a mobile phone or the internet to buy something online (% age 15+)	14.93
Used a mobile phone or the internet to pay bills (% age 15+)	2.72
Used a mobile phone or the internet to send money (% age 15+)	2.44

Source World Bank: Global Financial Inclusion (https://databank.worldbank.org/source/global-financial-inclusion)

address these potential hazards, it is advisable for users to select reputable MP service providers that implement strong security protocols, such as multi-factor authentication and regular updates for MP applications [1]. In order to mitigate the risk of malware compromise, it is advisable for users to exclusively obtain MP applications from official app stores. It is imperative to consistently update applications and

smartphone operating systems in order to take advantage of the most recent security patches [30]. It is advisable to augment security measures with two-factor authentication. Additionally, it is advisable for users to exercise prudence when utilizing public Wi-Fi networks and to abstain from inputting sensitive data when connected to unsecured networks [31].

Notwithstanding the growing prevalence of MPs, a subset of merchants has yet to adopt this technology, presenting obstacles for consumers who are highly dependent on MPs. Educating and incentivizing merchants regarding the simplicity and advantages of MPs can potentially stimulate increased rates of acceptance [32]. The lack of uniform procedures among different MP platforms presents difficulties for both vendors and customers. Due to the fact that every platform has unique compatibility concerns and requirements, merchants are compelled to purchase multiple payment terminals or software solutions. A seamless experience for all parties can be facilitated through the establishment of common standards and the promotion of interoperability through collaborative endeavors among industry stakeholders in Palestine [31]. Establishing credibility with Palestinian consumers regarding MPs is vital for broad acceptance. Concerns regarding the privacy and security of financial data are prevalent among those who utilize MP methods. According to Shuhaiber [33], in order to establish confidence in the dependability of MP systems, it is imperative that MP service providers place a high value on transparency, inform users about security protocols, and provide strong customer assistance. Moreover, certain online payment methods are considered less appropriate for consumers due to their higher cost [1]. Hence, it is recommended that MP platforms implement loyalty programs, rewards systems, and discount schemes to encourage users to adopt cashless transactions [8].

Palestine, as stated by Bjørn and Boulus-Rodje [34], is deficient in critical mobility-related infrastructure, legal frameworks, payment gateways, and mobile Internet. MPs are reliant on internet connectivity and a resilient infrastructure, which can pose difficulties in areas where network coverage is insufficient or internet connections are unreliable. Technological advancements, such as the implementation of QR codes and offline payment processing, have the capacity to overcome these obstacles and guarantee MP accessibility in all regions [35].

In summary, the augmentation of the MP in Palestine necessitates the mitigation of security vulnerabilities, promotion of standardization, facilitation of merchant acceptance, infrastructure enhancement, and development of consumer confidence. These measures are crucial in the pursuit of establishing a cashless society and transforming financial transactions through the use of MPs.

4 Mobile Payments Advantages

MPs have revolutionized the transactional landscape by integrating themselves seamlessly into our daily lives. The prevalence of smartphones and mobile banking applications has led to a growing preference among individuals to conduct transactions via their mobile devices rather than carrying physical currency. The transition towards

MPs is not unexpected, considering the numerous benefits they provide in comparison to conventional cash transactions [36]. This segment delves into a selection of these advantages.

Convenience is an exceptional feature of MPs in comparison to conventional cash transactions. This is attributed to the straightforward nature of the payment process, which eliminates the need to transport cumbersome, particularly for larger transactions, physical currency. Additionally, MPs are accessible from any location and at any time via the internet. Business travelers and other individuals with hectic schedules will find this adaptability to be especially beneficial [1, 37].

In terms of security, MPs exceed conventional cash transactions. Although cash inherently carries the risk of theft or loss, MP transactions are safeguarded by encryption, which guarantees the confidential data remains secure. In addition, MP applications integrate strong security protocols, such as two-factor authentication and fingerprint recognition, which significantly bolster their protection in comparison to cash transactions [5].

Particularly for larger payments, the process of counting physical currency can be time-consuming. In contrast, MP transactions are finalized within seconds. The aforementioned swiftness confers notable benefits in situations that require promptness, such as procuring groceries in a crowded supermarket or remitting a taxi fare [38].

The task of overseeing and documenting cash expenditures can prove to be difficult, especially when multiple transactions occur throughout the day. While MPs do offer an exhaustive log of every transaction, they streamline the procedure of monitoring expenditures and efficiently administering finances [39].

Loyalty programs are an advantageous feature of MPs that are not viable in the context of conventional cash transactions. The use of MPs grants access to cashback offers, rewards points accumulation, and discounts, all of which contribute to long-term savings. In addition, specific MP applications provide their users with exclusive discounts and offers, a benefit that is inaccessible to those who pay in cash [40].

While there may be circumstances, such as in regions with limited internet access, where cash transactions are inevitable, the overall trend is clear: MPs signify the forthcoming standard for financial transactions. Consequently, it is essential to adopt this technology and capitalize on its benefits. Certain works is needed by policymakers to adapt the Palestinian environment to comply with this trend.

5 Security Concerns in Mobile Payment Systems

When utilizing MPs, security is paramount. The absence of adequate security measures for MP is generally acknowledged as a significant associated obstacle [1]. As stated by Al-Saedi [41], the safety and integrity of MP systems are contingent upon the implementation of a number of security measures. MP systems commence their security measures with rigorous authentication and authorization procedures. With the increasing adoption of MP systems, security must become a top priority

for both users and service providers in order to protect sensitive financial data [42]. Likewise, two-factor authentication increases the level of security provided by MP systems. By implementing a two-factor authentication system, wherein individuals must supply a one-time verification code via SMS or email in addition to a password or PIN, the likelihood of fraudulent transactions and unauthorized access is substantially diminished [43]. In addition, tokenization is an essential security protocol that substitutes genuine credit card numbers with distinct, arbitrary-generated tokens. Subsequent to a data breach, these tokens remain devoid of significance to potential intruders and thus cannot be employed to execute fraudulent transactions; thus, they safeguard sensitive cardholder information [44]. Encryption is an essential component in safeguarding MP systems as it ensures the privacy of sensitive data throughout its transmission and storage. Strict encryption algorithms guarantee the integrity of user data, encompassing payment card information and personal information, against unauthorized intrusion. In order to safeguard transmitted data during transactions, secure connections are formed utilizing protocols such as SSL or TLS [30]. In conclusion, biometric authentication methods, including facial recognition and fingerprint recognition, add an extra level of security to MP systems. By capitalizing on distinct biological characteristics, these approaches provide a risk-free and practical means of verifying user identities, guaranteeing that solely authorized users are granted access to and can operate MP applications [45].

Security measures within MP systems are vital to safeguard users' financial information and ensure a secure digital economy. Authentication and authorization mechanisms, encryption, tokenization, and biometric authentication provide users with the confidence to engage in electronic transactions securely [5].

6 Mobile Payments and Financial Inclusion

The global trend towards financial inclusion has accelerated by providing access to financial services for both individuals and businesses. By providing individuals who were previously excluded from the formal banking system access to and engagement in the digital economy, MPs have emerged as a powerful instrument for promoting financial inclusion. The advent of mobile phones has enabled individuals to conduct financial transactions in a secure and convenient manner, even in geographically isolated and underserved regions [7].

MPs act as an intermediary between the unbanked and the formal financial system, enabling millions of people around the world to conduct necessities. Through the utilization of mobile phone technology, individuals are able to effortlessly transfer funds, pay bills, and receive wages through their mobile wallets [6].

Additionally, MPs provide unbanked individuals with access to formal financial services that were previously inaccessible to them. Mobile wallets provide users with the ability to access savings accounts, investigate insurance products, and obtain small

loans [6]. Moreover, MPs play a role in mitigating the prevalence of financial exclusion and aid in the resolution of geographical barriers that hinder certain individuals from opening bank accounts [7].

Furthermore, by addressing obstacles to accessing financial services, MPs possess the capacity to empower women and marginalized communities. This would grant them the ability to engage in economic activities, oversee their finances, and develop financial resilience [8]. As an illustration, the partnership between non-governmental organizations and mobile financial service provider bKash in Bangladesh has increased financial inclusion among rural women, thereby bolstering their economic opportunities and empowering them to participate in household decision-making [6]. Additionally, MPs can provide underserved populations with financial education through their platforms. By means of text messages and mobile applications, individuals are able to receive reminders, educational programs, and tips that assist them in making well-informed financial decisions [22]. In fact, they furnish users' mobile phones with educational materials concerning budgeting, saving, and debt management. This empowers individuals with the necessary understanding and abilities to make well-informed decisions regarding their finances [6].

The emergence of MPs has significantly transformed the operational environment for small enterprises, presenting an array of advantages that were hitherto impossible [46]. The adoption of MPs by small businesses facilitates operational streamlining, diminishes dependence on tangible cash transactions, and offers customers a more convenient payment alternative. In addition to conserving time and resources, this increased efficiency improves the customer experience as a whole [47]. In addition, MPs alleviate small businesses' financial burdens by eliminating the requirement for costly card processing equipment and conventional point-of-sale systems [47]. Tablets or smartphones that have been updated with MP applications function as versatile and economical payment terminals. In addition, MPs eliminate the potential for fraud and theft associated with cash transactions, thereby reducing the need for expensive security measures [42]. Conversely, MPs enable small enterprises to expand their customer reach by catering to technologically inclined individuals who favor digital transactions. Businesses have the opportunity to expand their reach to customers from various geographic regions by adopting MPs [48].

MPs have become a catalyst for change in the fight for financial inclusion. Further advancements in mobile phone technology and the growing international recognition of MPs are expected to facilitate additional strides in promoting financial inclusion and empowering individuals to engage actively in the digital economy [1]. Legislators have exerted a substantial influence on small enterprises and the economy at large. In a cashless society, small businesses rely heavily on MPs due to the expansion of their customer base, cost savings, enhanced efficiency, and improved customer experience. Small businesses contribute to the expansion of the digital economy and maintain competitiveness in the face of shifting consumer preferences through the implementation of MP solutions [36].

7 The Future of Mobile Payments

Fundamentally, information technology facets are perpetually evolving and distinguished by consistent innovation. In the context of MP, prospective advancements will augment security measures and provide a cohesive user experience through the incorporation of biometric authentication techniques, such as facial recognition, fingerprints, or iris scans [35]. This technology has been implemented by platforms such as Apple Pay, establishing a model for subsequent MP solutions. Furthermore, advancements in technology such as Near Field Communication (NFC) will further transform in-store transactions by enabling contactless payment methods. This technique provides a streamlined payment experience and mitigates the potential for the transmission of germs by enabling users to scan their cards or mobile devices onto payment terminals [1]. Furthermore, in order to optimize payment processes, mobile wallets will progress by integrating various payment methods—such as loyalty cards, credit cards, and debit cards—onto a solitary, user-friendly platform. In addition to the aforementioned features, these wallets will provide budgeting tools, rewards programs, and personalized offers [49]. In addition, the incorporation of Internet of Things (IoT) devices into MP technology will facilitate smooth transactions that obviate the necessity for a tangible wallet or smartphone. The integration of connected cars and smartwatches into the payment system will streamline the procedure in a variety of situations [50]. Furthermore, the implementation of blockchain technology in MPs has the capacity to augment security, transparency, and efficiency. Blockchain has the potential to enhance security and streamline cross-border transactions by capitalizing on its decentralized and immutable attributes; this can be achieved through cost reduction and the elimination of intermediaries [46].

These upcoming trends and innovations in MP technology are set to redefine how transactions are conducted, offering advancements in convenience, security, and efficiency. From biometric authentication and contactless payments to mobile wallets, IoT integration, and blockchain technology, the future of MPs promises to drive us towards a cashless society fueled by electronic payments.

8 Conclusion

Ultimately, the emergence of MPs has brought about a paradigm shift in financial transactions, providing an unprecedented level of convenience, security, and efficacy in the present-day era. The adoption of MPs as an alternative to conventional cash transactions by both consumers and businesses has contributed to the growth of the digital economy. The ease of use and stress-free experience provided by MPs are clear indications of their convenience; they eliminate the necessity for cumbersome wallets and streamline transactions to a few taps on smartphones. Additionally, stringent security protocols, including authentication techniques and encryption, safeguard

users' financial data to an extent that exceeds that of traditional payment methods such as cash or credit cards.

Promising in efficiency, MPs streamline business operations via process automation and improve the overall customer experience through the execution of transactions in a timely manner. It is of the utmost importance that organizations and individuals prioritize the adoption of trustworthy MP platforms that employ strong security protocols, and that merchants are adequately prepared to accept MPs, as non-cash transactions gain traction. Constant vigilance regarding transactions enables the prompt detection and reporting of any suspicious activities, thereby protecting financial data.

We anticipate that the prevalence of MP operations will increase as technology develops. In order to mitigate the adverse effects of the dearth of education regarding electronic digital interaction, specifically in developing nations, it is possible to cultivate confidence in MP technologies by means of educational endeavors targeting diverse segments of society.

A number of interconnected obstacles exist in Palestine that hinder the progress of MPs. It is crucial, therefore, to implement initiatives to surmount these challenges. In order to bolster the MP in Palestine, it is imperative to undertake the following measures: mitigate security risks, promote standardization, strengthen merchant acceptance, enhance infrastructure, and foster consumer confidence. These measures are crucial in the pursuit of establishing a cashless society and transforming financial transactions through the use of MPs.

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The Impact of a Company's Accounting Income and Capital Structure on the Economic and Financial Sustainability—An Empirical Study on Industrial Companies Listed on the Palestine and Amman's Stock Exchange During for the Period 2016–2022



Ghassan Daas and Maram Mashaqi

Abstract The objective of the research was to assess the impact of accounting income and the capital structure on the financial and economic viability (sustainability) of industrial firms listed on the Amman and Palestine Stock Exchanges, determining which of these is most impacted by accounting income and capital structure. on The sustainability measures represented in tax payments to the government, productive diversity, the availability of training courses for employees, the presence of women in the labor market, and return on equity (ROE). The study data was collected for the period 2016–2022 on a sample of 44 firms. The data were analyzed and the hypothesis tested using correlation and regression models. The study discovered that accounting income has a positive significant impact on both the economic and financial sustainability for both Palestinian and Jordanian firms and considered as the main determinant of that. The study suggested that public shareholding companies' management expand employee training opportunities to boost workers' productivity and qualifications, which will enhance their performance and help the company achieve economic sustainability. They should also expand employment opportunities for women and expand the number of production lines to determine the best possible indicators levels to help the company achieve economic sustainability, also to concentrate on the cost.

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Keywords Accounting income · Capital structure · Economic sustainability · Financial sustainability · ROE · PEX · ASE

1 Introduction

The challenges that businesses face in promoting sustainable development have received worldwide attention. In addition to commercial considerations, businesses must also consider sustainability from social and environmental perspectives. This allows them to report on their economic and non-economic performance. From a government point of view, it is also essential to quantify and convey the effects of economic, social, and environmental performance. Moreover, establishing and maintaining the firm's reputation is critical. This trust is based on business decisions and tactics that affect both stakeholders and the organization. Sustainability reporting has the added advantage of making businesses more transparent and taking into account all relevant factors. It does so by exposing the public to the dangers and effects of the issues at hand. Despite the possibility that their activities could harm the environment, businesses often overlook the social and environmental consequences of their economic activity. Stakeholder awareness and media pressure have led companies to include sustainability in their vision, mission, strategy, planning, and decision-making. By reviewing the company's sustainability disclosures, the board of directors, as a member of top management, can ensure that shareholder interests are protected. It is one of the primary means by which managers communicate and distribute information about sustainability initiatives to all stakeholders [1].

A company's capital structure typically emphasizes a combination of debt and equity financing. A company's financial health depends on a variety of financial decisions. Empirical data indicates that a company's decision on which funding sources to use—debt or equity—has a big impact on the company's worth. Making the wrong capital structure decision could cause a business to face financial challenges and, eventually, insolvency. For instance, businesses that have significant amounts of long-term debt that are poorly managed have a higher risk of going bankrupt. Furthermore, maintaining the debt-to-equity ratio is a necessary part of financial planning to maintain public confidence because raising long-term debt shows that management is shifting the company's risk to bondholders or creditors, which raises agency costs and worries shareholders. Ref. countered that firms with lower liquidity and fewer non-debt tax shelters incur higher agency costs and that issuing shares during the debt reduction stage increases the likelihood of a rapid failure. The trade-off theory, which contends that business leverage is established by weighing the benefits of debt tax reduction against the expenses of bankruptcy, provides evidence of this. Thus, managers choose a company's capital structure to maximize its net worth. This demonstrates how a firm's profitability is greatly impacted by its capital structure decision [2].

Because of the unpredictable, uncertain, and unstable nature of the current political and economic climate, as well as the disruptions to customer and supplier interactions, firms must reevaluate their development goals to achieve effective growth. Apart from the primary objectives of the operation, companies are facing challenges in maintaining strong economic indicators, which reduces their activities to a battle for survival. Consequently, the pursuit of sustainable growth and development becomes imperative [3]

2 Problem Statement

Accounting's focus changed from the concept of ownership, which crystallizes in maximizing the self-interest of the owners as it is the primary responsibility of management, to the concept of the accounting unit, which considers the owners as one of the stakeholders in the company [4]. So a company's decision on which funding sources to use—debt or equity—has a big impact on the company's worth. Making the wrong capital structure decision could cause a business to face financial challenges and, eventually, insolvency. For instance, businesses that have significant amounts of long-term debt that are poorly managed have a higher risk of going bankrupt. The evaluation of a firm's financial soundness in the ever-changing world of international commerce goes beyond conventional accounting measures. Scholars, practitioners, and politicians alike are now focusing on accounting income—a measure of a company's underlying activities. According to the hypothesis, a business that only employs equity financing outperforms one that has a large amount of debt on its statement of financial position. The pecking order theory, however, contends that businesses should sequence their funding sources so that equity must be employed as a third source when debt is insufficient and internal financing through net operating income comes in first [2].

Therefore, many businesses started to rely less on maximizing financial gains to establish their reputations and more on disclosing financial and non-financial information to inform their stakeholders about the company's economic performance [5]. Although accounting income is commonly used as a standard measure to evaluate financial performance, it is still unclear how much of an impact it has on sustainability given its correlation with economic revenue [6].

Accounting income, Capital Structure and Economic sustainability are becoming more and more important in the context of corporate responsibility, and it merits scholarly study but there aren't many studies that give a broad picture of the impact of these on Economic sustainability. With human progress and industries expanding, the world has split into two camps: one of them supports the priority of economic growth without regard for the environment [7].

In the context of the financial and economic sustainability, the research problem can be presented as: "What is the impact of a Company's accounting income and Capital Structure on the Economic and Financial sustainability? It is an empirical

study on industrial companies listed on the Palestine and Amman's Stock Exchange during for the period 2016–2022.

Accordingly, the research proposes the following question:

- What is the impact of a Company's accounting income on the economic sustainability of Industrial Companies Listed on Palestine & Amman Stock Exchange?
- What is the impact of a Company's accounting income on financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange?
- What is the impact of a Company's Capital Structure on economic sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange?
- What is the impact of a Company's Capital Structure on financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange?

3 Importance of the Research

The industrial companies [8] use a lot of resources in the course of their daily operations, they are generally characterized by a boring, routine nature that makes the wheel of economic growth slowed because many of those resources are scarce or limited, whether they be natural, economic, or other resources. They are responsible for both the welfare of the present and future generation, making it necessary for those businesses to exercise their economic sustainability, their vision, mission, strategy, planning, and decision-making. According to the information provided, and a review of previous literature regarding sustainability, a research gap was found related to accounting income and Capital Structure impact on Economic sustainability, although there are previous studies conducted to find the effect of accounting income on sustainability performance, so there is lake of studies which examines the relationship between these variables and the Economic and Financial sustainability.

According to [9] the impact of common share capital on financial sustainability has been the subject of conflicting research by different researchers. Some discovered that the impact of common share capital on long-term financial viability was negligible. However, some researchers came to the opposite conclusion that common share capital had a detrimental impact on financial sustainability while others decided that common share capital had a favourable effect. So this study is important because it highlights their impact on economic and financial sustainability, provides a more accurate picture of a company's financial performance, enhances stakeholder communication, guides investor decisions, evaluates performance, allocates capital efficiently, and improves decision-making.

4 Objectives

Since this subject is so important, the study's objectives are as follows:

1. Identify the impact of accounting income on economic sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.
2. Identify the impact of accounting income on financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.
3. Identify the impact of Company's Capital Structure on economic sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.
4. Identify the impact of Company's Capital Structure on financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.

5 Theoretical Framework, Literature Review, and Hypothesis Development

5.1 Theories

According to [10], the best way to achieve growth and capitalist development is to adopt policies that encourage competition and give economic actors more freedom to pursue their interests in line with the widely accepted notions that human nature is characterized by a desire to trade, better oneself materially, and take advantage of advantageous opportunities. In order to stimulate growth [11], the government must increase demand. The shift from goods to services creates forecasts that align with cross-country growth data. These forecasts include an increase in the real investment rate, a decrease in the real interest rate, the marginal product of capital, and an acceleration of technical development particularly in investments as the share of services rises [12].

The main theories Related to the subject:

Stakeholders Theory: [13–15] the voluntary sustainability disclosure of an organization is influenced by a variety of stakeholders, including shareholders, creditors, suppliers, managers, customers, competitors, employees, their families, the media, local communities, charitable organizations, and future generations. Companies will provide more information on sustainable development to minimize the costs associated with inspections and to evade government control and inspection. Managers, on the other hand, anticipate a relaxation of state management regulations when the information is voluntarily shared. The management of a related party's relationship and the company's obligations to them.

Agency Theory: [16] there is a greater likelihood of voluntary sustainability information disclosure from large corporations. The interaction between managers and owners is depicted by agency theory. There is cause for concern that the manager of

the company will not operate in the best interests of the owners, who are the shareholders. If both sides (the owners and the managers) wish to maximize their interests. Agency theory explains why shareholders and creditors get information from annual reports.

Political Economy Theory: [17, 18] managers like the government, labor unions, or community organizations base their choices about matters pertaining to the company's interests (such tax laws, monopoly limits, and competition) on the information that businesses provide.

Signaling Theory: [17, 19] the theory indicated that financial decisions are signals to investors to take feedback into account. The company's financial communication policy is based on this signal. According to signal theory, profitable businesses frequently use financial data as a marketing signal. Greater information transparency will help the business draw investors and facilitate capital raising. As a result, the manager can provide financial statement users with information on corporate sustainability, enabling them to evaluate the company's performance accordingly.

The trade-off theory: this theory [20] introduced that the interest tax shields associated with debt and the costs of financial distress into a state preference model. The trade-off theory of capital structure postulates that managers attempt to balance the benefits of interest tax shields against the present value of the possible costs of financial distress. According to the trade-off hypothesis, there should be an ideal capital structure that strikes a balance between the cost of bankruptcy and the present value of interest tax shielding

5.2 The Conceptual Framework of Economic Sustainability

5.2.1 Sustainability Concept

According to [21] there was a major focus on the idea of sustainability in the early 1970s of the previous Century. Sustainability refers to the coexistence of society within the constraints of available resources in order to achieve social welfare, and it is defined as satisfying the needs of current generations without compromising the capabilities and needs of future generations [5]. Sustainability is the ability of a company to maintain the natural environment and cultural.

5.2.2 Dimensions of Sustainability

There are three sustainability dimensions that are economic, social, and environmental which have come into greater focus in recent years as a result of growing public interest in sustainability [7] and in this research we will focused on the economic

dimension that is relates to economic vitality and diversity within the company. Economic Dimension is required in order to survive in the market by enhancing its financial performance.

5.2.3 Growth in the Economy and Sustainable Development

The interaction of various economic resources is what drives economic activity. The quality and quantity of human and natural resources enable economic growth and comprehensive economic development, which entails significant structural changes in the economy and permits the creation of plans and programs in every area covered by the dimensions of sustainable development. Sustainability accounting standards are essential governance instruments in order to achieve the goals of economic sustainability. It is optional but not required to report on sustainable practices [5].

Through sustainability, a society can develop infinitely, both in terms of its technological aspect and its capacity to ensure rising income levels for future generations. From a strictly classical standpoint, sustainability refers to the maintenance and expansion of economic well-being for the longest amount of time. This well-being is determined by rates of income and consumption, the latter of which includes many necessities for human survival, including clothing, food, housing, transportation, health care, and education, by "discovering and adopting new and better production methods, as well as working to raise production levels by developing human energies and skills. Economic development is defined as "the development of societies" [3]

5.3 The Conceptual Framework of Financial Sustainability

Despite financial sustainability's lack of embeddedness in definitions and measures of economic sustainability, it is possible to explicitly differentiate between various terms [22]. Additionally, accounting theory's "principles of capital maintenance" align with financial sustainability. Many businesses are under pressure to implement sustainable practices because of the many advantages that come with being sustainable. Good capital structure decisions are essential for corporations to become sustainable since they maximize earnings, which in turn makes them sustainable [2].

Microfinance institutions are able to meet all of their operational, financial, and service costs in order to maximize equity market value and accomplish their social objectives. Customers and politicians in developing nations like Pakistan, India, and Bangladesh frequently criticize microfinance institutions (MFIs) for charging exorbitant interest rates in an effort to achieve financial sustainability. All stakeholders have the same primary objective, which is to measure the financial performance of their assets. The majority of earlier research focuses on earnings per share (EPS), return on equity (ROE), return on assets (ROA), and return on sales. Positive correlations between CSR and financial performance are also seen in this research.

Accounting returns and investor returns are the two metrics used to quantify financial sustainability [23].

Accounting practices can enhance financial sustainability when they are used to create value for stakeholders. Because sustainability is so embedded in accounting, the idea of sustainable accounting has grown. Sustainability accounting uses cutting-edge information management and accounting strategies to deliver relevant, high-quality data that supports the long-term, sustainable growth of enterprises. Accounting researchers assert that accounting can be a component of numerous accounting processes, such as accounting techniques for sustainability [24].

5.4 Literature Review and Hypothesis Development

5.4.1 Accounting Income

An entity's net income for any period is the most that can be distributed to its owners during that period while still allowing the entity to have the same net worth at the end of that period as it did at the beginning, after adjusting for the contributions of the owners. In other words, an entity must maintain capital before it can generate income. It should be noted that according to financial accounting theory, capital maintenance refers to financial capital maintenance rather than physical capital maintenance; the distinction between the two is found in how capital is defined. A financial capital method defines capital as the company's net assets, or all assets less all liabilities. A physical capital method measures a firm's productivity, not its financial position. In other words, income only arises from the physical approach if the value of the company's current inventories, along with its property, plant, and equipment, rises throughout the course of the period, after deducting the cost of further purchases made with the help of outside finance [25].

According to the above, we propose the following hypothesis:

H1 There is no impact of accounting income at the level of significance ($a < 0.05$) on economic sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.

H2 There is no impact of accounting income at the level of significance ($a < 0.05$) on financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.

5.4.2 Capital Structure

There are two categories of sources of capital formation: external and domestic sources. For this reason, choosing the best sources of funding is crucial to the health and long-term viability of the business's finances. Selecting a sound and ideal capital structure is crucial since it will influence the expenses that the business will incur.

According to [26] the theories mostly debate the best ways to optimize and balance the capital structure in order to maximize the market value of the company. However, achieving long-term sustainable development is every corporation's primary internal goal. One of the financial elements that affects a company's ability to grow sustainably is its capital structure [27]. Financial sustainability or short-term financial sustainability can indirectly affect long-term financial sustainability.

The capital structure has a big impact on asset returns. The availability and burden of capital are significantly impacted by the capital structure, which in turn impacts the performance of the business [26].

According to the above, we propose the following hypothesis:

H3 *There is no impact of Company's Capital Structure at the level of significance ($a < 0.05$) on economic sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.*

H4 *There is no impact of Company's Capital Structure at the level of significance ($a < 0.05$) on Financial sustainability of Industrial Companies Listed on the Palestine & Amman's Stock Exchange.*

According to [28] inclusion of company's age and size, can impact company's decision in economic sustainability. Research has shown that corporate characteristics affect how sustainability is implemented and disclosed. Considers size to be a risk factor, [29] note that larger companies (in terms of total assets) are more knowledgeable about risk management and are more diversified. Larger businesses typically reveal more information than smaller ones. Big, profitable businesses may afford to pay extra for sustainability reporting or the fullest transparency of financial accounts. The difference in capital structures between industrial companies listed on the ASE and PEX stock markets also should be measured against the impact of the accounting income and the capital structure on both financial and economic sustainability.

6 Methodology and Procedures

The current study aims to determine the impact of accounting income & Capital Structure on the economic and financial sustainability of industrial companies listed on the Palestine & Amman's Stock Exchange.

6.1 Population and Sample

The research population and sample consists of all industrial companies listed on Palestine and.

Amman's Stock Exchange. Data was collected over the period (2017–2022) (Table 1).

Table 1 Study population and sample

Name of the exchange	Companies	Percentage (%)
PEX	11	25
ASE	33	75
Total	44	100

6.2 Data Collection

The data primarily comes from the annual financial reports of industrial companies and from the disclosures issued for the period (2017–2022) and published on the websites. In addition to consulting academic publications on the topic, whether they be from Palestine & Amman (Table 2).

6.3 Variables

6.3.1 Models:

Model 1: Economic sustainability $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

a0: represent Intercept;

β1-6 represents regression coefficient; AI: Accounting Income; CS: Capital Structure; FAGE: Firm Age; FSIZ: Firm Size; ε; error term.

So the multiple regression equation are:

Tax (spending to the government) $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

Line of production $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

Training courses $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

Women's existence $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

Capital structure has a crucial effect on the financial sustainability of companies. To examine the link between capital structure and the financial sustainability of the entities studied more extensively, a model encompassing seven distinct variables was established for estimation. In the model, financial sustainability was the criterion variable represented by return on equity (ROE) [37]. In contrast, the debt ratio (DR) and the debt-to-equity ratio (DE) were the surrogates of capital structure. Because of the consequences of omitted variable bias, the study controlled for firm size (SIZE) firm Age (AGE). The model formulated to study the nexus within the series was specified as follows:

Model 2: ROE $= a0 + 1AI + \beta 2CS + \beta 3FAGE + \beta 4FSIZ + \varepsilon$.

a0: represent Intercept; β1-6 represents regression coefficient; AI: Accounting Income; CS: Capital Structure; FAGE: Firm Age; FSIZ: Firm Size; ε; error term.

Table 2 Variables structure

The variable	Accounting income (AI)	Capital structure (CS)	Economic sustainability	Financial sustainability	Size of the company (FSIZ)	Age of the company (FAGE)
Variable type	Independent	Independent	Dependent	Dependent	Control	Control
Definition	An increase in economic benefits during the accounting cycle in the form of income flows or an increase in assets that results in an increase in property rights other than those associated with the contributions of equity holders [30]	The amount of money, or capital that finances a business's operations, assets, and support. Additionally, it can display capital expenditures and business acquisitions that may have an impact on the company's profitability [31]	Propose an equitable distribution and efficient allocation of resources and the business should be profitable [25]	Is the process by which a business manages its finances to ensure that its present financial success does not jeopardize its prospects for future financial success, including the success of future generations? Since businesses must turn a profit in order to remain in business, the majority of them see the financial pillar as their foundation for success	Natural logarithm of total assets [32]	The variable is usually referred to as a control variable; it is rarely used as an explanatory one [33] the number of years of incorporation of the company [34]

(continued)

Table 2 (continued)

The variable	Accounting income (AI)	Capital structure (CS)	Economic sustainability	Financial sustainability	Size of the company (FSIZ)	Age of the company (FAGE)
Measurement	Reported income in the financial statements	Capital Structure = Cost of debt / cost of equity [24]	Economic indicators: • Government tax: tax and fees payed to the government • Diversification: diversification of production given by the number and relative importance of products and services sold business diversification is measured by [35] the number of production lines • Training courses: the availability of training courses, 1 for the availability, 0 if no training courses introduced • Women Employment existence, existence of employment = 1, unemployment = 0	(Net Income/Average Shareholders' Equity) * 100	Natural Logarithm of total assets [29]	No of years since incorporation [36]

7 Results and Findings

7.1 Correlation and Multicollinearity Analysis, Palestinian Firms

The correlation matrix indicates that any value in the matrix not exceeds 80% between the independent, so there is no probability of multicollinearity effects signs between the independent variables. The values mostly indicate that a positive correlation between the accounting income and annual tax, training course, women's existence, and ROE. Whereas negative correlation with lines of production. The results also indicate that a negative correlation between capital structure and annual tax, training course, women's existence. Whereas positive correlation with lines of production and ROE (Table 3).

7.2 Correlation and Multicollinearity Analysis, Jordanian Firms:

The correlation matrix indicates that any value in the matrix not exceeds 80% between the independent, so there is no probability of multicollinearity effects signs between the independent variables, also the result supports the regression results that all VIF less than 5. The values mostly indicate that a positive correlation between the accounting income and annual tax, women's existence, production lines, and ROE. The results also indicate that a negative correlation between capital structure and annual tax, line of production, and ROE. Whereas positive correlation with women existence. Correlation of training courses was not performed as the variable is constant (Table 4).

7.3 Economic Sustainability

The economic sustainability with its four measured components tested against the impact of the accounting income and the capital structure.

- **Government Spending (Tax and Fees)**: for the Palestinian firm's net income and the capital structure have a significant impact, positive for net income and negative for the capital structure. 0.394 of coefficient of determination which means that 39.4% of the variation of the Government Spending (Tax & Fees) due to the independent and control variables. For the Jordanian firm's net income only with a significant positive impact, positive for net income and negative for the capital structure. 0.868 of coefficient of determination which means that 86.8% of the

Table 3 Palestinians firms, correlation matrix

		Government tax	Capital structure	Net income	Training courses	Women's existence	Line of production	ROE	Firm size	Age of company
Government tax	Correlation	1	− 0.344**							
	Sig		0.002							
Capital structure	Correlation	− 0.344**	1							
	Sig	0.002								
Net income	Correlation	0.510**	− 0.263*	1						
	Sig	0.000	0.021							
Training courses	Correlation	0.245*	− 0.021	0.217	1					
	Sig	0.032	0.858	0.058						
Women's existence	Correlation	0.245*	− 0.021	0.217	1.000**	1				
	Sig	0.032	0.858	0.058	0.000					
Line of production	Correlation	0.114	− 0.302**	− 0.112	0.140	0.140	1			
	Sig	0.325	0.008	0.331	0.225	0.225				
ROE	Correlation	0.139	− 0.241*	0.664**	− 0.146	− 0.146	0.215	1		
	Sig	0.228	0.034	0.000	0.206	0.206	0.060			
Firm size	Correlation	0.469**	0.041	0.518**	0.774**	0.774**	− 0.216	− 0.099	1	0.582**
	Sig	0.000	0.724	0.000	0.000	0.000	0.059	0.390		0.000
Age of company	Correlation	0.302**	− 0.107	0.331**	0.364**	0.364**	− 0.141	− 0.019	0.582**	1
	Sig	0.008	0.353	0.003	0.001	0.001	0.221	0.868	0.000	

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Table 4 Jordanian firms, correlation matrix

		Net income	Capital structure	Government tax	Line of production	Training courses	Women's existence	ROE	Firm size	Age of company
Net income	Correlation	1								
	Sig									
Capital structure	Correlation	− 0.017	1							
	Sig	0.802								
Government tax	Correlation	0.919**	− 0.010	1						
	Sig	0.000	0.883							
Line of production	Correlation	0.027	− 0.029	0.000	1					
	Sig	0.687	0.664	0.996						
Training courses	Correlation	0[a]	0[a]	0[a]	0[a]	0[a]				
	Sig									
Women's existence	Correlation	0.069	0.040	0.041	0.165*	0[b]	1			
	Sig	0.294	0.550	0.537	0.012					
ROE	Correlation	0.400**	− 0.038	0.353**	0.155*	0[b]	0.111	1		
	Sig	0.000	0.563	0.000	0.019		0.093			
Firm size	Correlation	0.414**	0.047	0.262**	0.194**	0[b]	0.426**	0.186**	1	
	Sig	0.000	0.478	0.000	0.003		0.000	0.005		
Age of company	Correlation	0.277**	− 0.034	0.182**	− 0.235**	0[b]	− 0.134*	0.133*	0.095	1
	Sig	0.000	0.603	0.006	0.000		0.041	0.043	0.150	

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

[a]Cannot be computed because at least one of the variables is constant

variation of the Government Spending (Tax & Fees) due to the independent and control variables which is higher of the Palestinian firm's model.

- **Line of production**: for the Palestinian the capital structure with negative significant impact. 0.149 of coefficient of determination which means that 14.9% of the variation of the line of production due to the independent and control variables. For the Jordanian firms none of the independent variable have significant positive or negative impact. 0.104 of coefficient of determination which means that 10.4% of the variation of the line of production due to the independent and control variables which is less of the Palestinian firm's model

Training courses: for the Palestinian firms both of the net income and the capital structure have a significant negative impact. 0.677 of coefficient of determination which means that 67.7% of the variation of the training courses due to the independent and control variables. For the Jordanian firms the model will not performed because the variable (Training courses is constant).

Women existence: for the Palestinian firms both of the net income and the capital structure have a significant negative impact. 0.677 of coefficient of determination which means that 67.7% of the variation of the training courses due to the independent and control variables. For the Jordanian both of the net income and the capital structure have no significant impact. 0.218 of coefficient of determination which means that 21.8% of the variation of the training courses due to the independent and control variables which is less the Palestinian firms (Table 5).

7.4 Financial Sustainability

The financial sustainability measured by ROE tested against the impact of the accounting income and the capital structure. For both the Palestinian and the Jordanian firms, the net income has a positive significant impact on the financial sustainability measured by ROE. This because that the net income of one of the determinant of the ROE (Table 6).

8 Conclusions

For the Palestinian firms, the significant impact of the net income on the economic sustainability elements was positive for government spending, and negative for training courses and women existence, the high correlation between net income and the tax amounts is the cause of the positive impact. Whereas the capital structure has a significant negative impact on all the economic sustainability elements which is due to the amount of debts to equity in the capital structure.

Table 5 The impact on the economic sustainability

Coefficients—dependent variable: government spending (tax and fees)									
Model		Palestine				Jordan			
		B Coefficient	Sig	R square	VIF	B Coefficient	Sig	R square	VIF
1	(Constant)	− 1,340,547	0.011	0.394		29,297,543	0.000	0.868	
	Net income	0.019	0.031		1.536	0.291	0.000		1.297
	Capital structure	− 334,873	0.004		1.155	19,669	0.654		1.005
	Firm size	98,045	0.006		1.980	− 1,616,461	0.000		1.211
	Age of company	− 593	0.813		1.554	− 80,768	0.001		1.085
Coefficients—dependent variable: line of production									
Model		Palestine				Jordan			
		B Coefficient	Sig	R square	VIF	B Coefficient	Sig	R square	VIF
1	(Constant)	73.231	0.226	0.149		− 8.050	0.121	0.104	
	Net income	− 9.802E-7	0.338		1.536	8.506E-10	0.916		1.297
	Capital structure	− 37.892	0.005		1.155	− 0.033	0.450		1.005
	Firm size	− 2.237	0.577		1.980	0.935	0.002		1.211
	Age of company	− 0.181	0.534		1.554	− 0.099	0.000		1.085
Coefficients—dependent variable: training courses									
Model		Palestine				Jordan			
		B Coefficient	Sig	R square	VIF	B Coefficient	Sig	R square	VIF
1	(Constant)	− 2.774	0.000	0.677		N/A as the variable is constant			
	Net income	− 1.995E-8	0.000		1.536				
	Capital structure	− 0.152	0.030		1.155				
	Firm size	0.231	0.000		1.980				
	Age of company	− 0.003	0.078		1.554				

(continued)

Table 5 (continued)

Coefficients—dependent variable: government spending (tax and fees)									
Coefficients—dependent variable: women existence									
Model		Palestine				Jordan			
		B Coefficient	Sig	R square	VIF	B Coefficient	Sig	R square	VIF
1	(Constant)	− 2.774	0.000	0.677		− 1.024	0.000	0.218	
	Net income	− 1.995E-8	0.000		1.536	− 5.373E-10	0.211		1.297
	Capital structure	− 0.152	0.030		1.155	0.000	0.859		1.005
	Firm size	0.231	0.000		1.980	0.117	0.000		1.211
	Age of company	− 0.003	0.078		1.554	− 0.003	0.012		1.085

Table 6 The impact on the financial sustainability

Coefficients—dependent variable: ROE									
Model		Palestine				Jordan			
		B Coefficient	Sig	R square	VIF	B Coefficient	Sig	R square	VIF
2	(Constant)	0.917	0.000	0.712		0.018	0.811	0.162	
	Net income	2.401E-8	0.000		1.536	6.578E-10	0.000		1.297
	Capital structure	0.017	0.474		1.155	0.000	0.597		1.005
	Firm size	− 0.053	0.000		1.980	0.002	0.688		1.211
	Age of company	0.000	0.772		1.554	0.000	0.707		1.085

For the Jordanian firms, only positive significant impact of the net income on the economic sustainability of the government spending, and negative for training courses and women existence, the high correlation between net income and the tax amounts is the cause of the positive impact. Whereas the capital structure has no significant negative impact on all the economic sustainability elements which is due to the amount of debts to equity in the capital structure.

So, in both cases the net income is the determinant of the economic sustainability of the firms, highly correlated with the governmental tax amounts.

Accordingly, in both of the economic and financial sustainability be determined by the impact of the net income as the profitable firms will pay a lot for tax, internal development for its production lines, and develop its training courses to enhance its employee's skills for both men and women.

9 Recommendations

- Analyzing the relationship between economic expansion and sustainability. Indices of consumption, unemployment, and gross domestic product can be used for future research.
- Assessing the cost of sustainability: The objective of this study may be to ascertain the total cost of implementing sustainable practices in the economy or in specific industries. Examples of the kinds of analyses that could be included in the assessment include a cost analysis of switching to renewable energy sources, a cost analysis of recycling and waste management, and an analysis of the projected financial rewards from long-term sustainability.
- Evaluating the financial returns from sustainable investments: Analyzing the financial returns from sustainable investments in companies and projects. Two instances of analysis include comparing the financial returns of sustainable investments with those of conventional investments and evaluating the performance of sustainable businesses relative to non-sustainable firms.

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The Mechanism of Issuing Bonds and Financial Certificates and the Parties Involved in the Process



Ahmad Habes Theyab AL-Mjali

Abstract The primary objective of this study is to examine the concept of bonds or financial certificates, the process of issuing it, and the various entities involved in the securitization process. The findings shed light on the concept itself and underscored the significance of a robust regulatory framework that facilitates bonds or financial certificates issuance. It is crucial to note that legal and regulatory systems play a pivotal role in ensuring transparency and safeguarding the rights of all parties involved. In conclusion, the securitization process encompasses several key participants who assume vital responsibilities in the issuance of bonds or financial certificates. These participants include the organizer or issuer, who determines the terms and initiates the bonds or financial certificates issuance, the investors who acquire these bonds or financial certificates, and the law advisors who ensure compliance with the law concerned. Furthermore, there are additional parties such as agents and fund managers, who oversee bonds or financial certificates investments on behalf of investors, and underwriters, who guarantee subscription coverage in the event of insufficient demand from investors.

Keywords Bonds or financial certificates · Issuance mechanism · Securitization parties · Jordan

1 Introduction

Jordan, classified as a developing nation, faces prevalent economic challenges such as poverty, unemployment, and limited resources. It is widely recognized that the expansion of a country's economy hinges primarily on augmenting production, which

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is contingent upon two key factors: labor and capital. However, the acquisition of capital through the financing process poses a significant impediment to the production process.

The utilization of securitization as a financial tool in conventional economies involved the conversion of loans, which are considered illiquid assets, into bonds that could be subscribed to by a specialized company in order to acquire liquid cash assets. In the realm of Islamic finance, the concept of Sukuk emerged through various studies, notably Hamoud's examination of Muqarada bonds presented to the Islamic Fiqh Academy. Building upon this research, Abbadi and others creatively applied the principles of Muqarada bonds, resulting in the establishment of innovative guidelines based on contemporary jurisprudential efforts. As a result, the Provisional Law on Muqarada Bonds No. 10 of 1981 was issued, signifying the early adoption of this idea in Jordan. The Ministry of Awqaf and Islamic Affairs formed specialized scientific committees to thoroughly study this concept. Additionally, cooperation between the Islamic Research and Training Institute of the Islamic Development Bank and the International Islamic Fiqh Academy led to the issuance of a resolution pertaining to Muqarada and investment bonds (Provisional Law on Muqarada Bonds No. 10, 1981 [13]).

Islamic Sukuk are widely regarded as the most optimal Sharia-compliant method for acquiring financing at minimal expenses, particularly in the context of nations necessitating extensive funding for infrastructure, industrial, and agricultural ventures. Should these nations opt for borrowing, they would bear the additional weight of debt costs. Additionally, lending institutions impose certain conditions that may have political ramifications, potentially encroaching upon a country's sovereignty.

The rapid expansion of Islamic banking instruments has been acknowledged by the International Monetary Fund (IMF), as these products have gained significant traction among a diverse investor base, encompassing both governmental entities and private enterprises. Numerous countries, both in the Arab region and the Western world, are actively pursuing the issuance of Islamic Sukuk as a means to fund crucial developmental and infrastructure initiatives, invigorate financial markets, and address budgetary shortfalls.

1.1 Study Problem

Islamic Sukuk represents a contemporary financial instrument that harmonizes the principles of Islamic Sharia with the demands of modern economics. Given the escalating worldwide interest in Islamic finance, it becomes imperative to delve into the intricate workings of issuing Islamic Sukuk, as well as the obstacles and prospects associated with them. The process of issuing Islamic Sukuk encounters multifaceted hurdles encompassing legal, regulatory, and operational dimensions. Notably, there are challenges in upholding compliance with Islamic Sharia principles,

while simultaneously ensuring transparency and efficacy throughout the issuance procedure.

Considering Jordan's limited exposure to Islamic Sukuk, the present study aims to elucidate the procedure of issuing Islamic Sukuk and the entities engaged in the securitization process. Additionally, it will address the obstacles hindering the expansion of Islamic Sukuk issuance in Jordan, with the ultimate objective of formulating pertinent recommendations grounded in the study's outcomes.

The study aims to answer the following questions:

- What are Islamic Sukuk?
- What is the mechanism for issuing Islamic Sukuk?
- Who are the parties involved in the securitization process?

1.2 Study Significance

The significance of this research resides in its ability to enrich both scholarly and practical comprehension by offering a more profound understanding of Islamic Sukuk instruments and their issuance mechanism. This, in turn, contributes to the advancement of academic and practical approaches within this domain. Furthermore, the study endeavors to make practical contributions that aid in the enhancement of the efficacy of Islamic Sukuk as a financing instrument that conforms to the principles of Islamic Sharia, thereby bolstering and fostering the growth of the Islamic economy.

The objective of this study is to offer feasible resolutions and suggestions to assist relevant stakeholders in surmounting the obstacles encountered in the issuance of Islamic Sukuk. By doing so, it aims to streamline procedures, enhance transparency, and optimize efficiency. The findings of this study have the potential to inform the formulation of policies and regulatory frameworks pertaining to the issuance of Islamic Sukuk, thereby fostering an improved legislative and regulatory landscape within this sector.

1.3 Study Methodology

In order to define the concept of Islamic Sukuk and emphasize their issuance mechanism, the researcher employed the descriptive method, drawing upon previous studies on the subject matter. These studies encompassed research presented at conferences and seminars, as well as theses and dissertations examined within academic institutions.

The research is structured to explore the mechanism of issuing Islamic Sukuk and the parties involved in the securitization process:

- Definition of Islamic Sukuk.
- Mechanism of issuing Islamic Sukuk.
- Parties involved in the securitization process.

2 Definition of Islamic Sukuk

2.1 Linguistic Definition

The Arabic original linguistic meaning of the term "Sukuk" (singular: "sakk") entails a forceful and intense convergence of two entities, with its plural form being "Sukuk." Additionally, the term carries the connotation of "striking," as exemplified in a verse from the Quran which states, "So his wife approached with a cry [and struck her face] and said, '[I am] a barren old woman'" (Quran 51:29). The term "sakk" has been adopted from its Persian origin "chak," where it referred to written provisions and grants known as "chakak," signifying a document that acknowledges monetary transactions or rights of ownership [12].

2.2 Terminological Definition

Imam al-Nawawi provides an explanation of the term "Sukuk," stating that it is derived from the word "sakk" which refers to a written document of debt. Additionally, it can also denote a document issued by a ruler that specifies the quantity of food or provisions that an individual is permitted to sell prior to receiving them [1]. Hamoud [11], on the other hand, defines Sukuk as standardized-value documents that are issued in the names of subscribers who have made payment for their value. These documents are based on the participation in the profits and revenues generated from the invested project, with predetermined ratios. Furthermore, there is a gradual and systematic repayment of the subscribed principal until it is fully repaid.

According to the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), Sukuk are defined as certificates of equal value that represent undivided shares in the ownership of tangible assets, usufructs, or services. They can also represent ownership in assets of specific projects or investment activities. The AAOIFI further explains that Sukuk are issued after the receipt of funds, the closing of subscriptions, and the commencement of fund utilization for the intended purpose [2].

The International Islamic Fiqh Academy puts forward its own understanding of "Islamic securitization (taskeek)" as the issuance of financial certificates or papers of equal value. Such certificates stand for ordinary shares in ownership of present tangible or usufruct assets or assets to be created from the surpluses of subscription. The Academy emphasizes that these certificates are issued in accordance with Sharia-compliant contracts and adhere to Sharia rules [15].

It is important to note that the Academy distinguishes between traditional securitization and Islamic securitization. The conventional securitization refers to transforming debts into bonds with equal value, which is essentially interest-based debt. This process is deemed as impermissible according to Sharia [9].

The Islamic Finance Sukuk Law in Jordan describes Islamic finance Sukuk as documents of equal value that represent shared ownership in a project. These documents are issued in the names of their owners to provide funds for the realization and exploitation of the project with an aim of achieving returns that comply with Islamic Sharia principles and rules. The Sukuk period is defined in the prospectus document exchange at issuance. This law was enacted in 2012 under No. 30.

The comprehensive and closely aligned definition of Islamic Sukuk provided by the AAOIFI is the foundation upon which this study is based. This definition is particularly valuable due to its alignment with the Jordanian legal definition of Sukuk. According to this definition, Sukuk can be understood as a document that confers upon its holder the right and share in the ownership of a specific project, effectively making the holder a partner in the project with limited profit and loss sharing. It is important to note that Sukuk differ from financial bonds in that they do not represent a debt for the holder.

2.3 Key Points Derived from the Definitions

1. **Equal-Value Documents:** Islamic Sukuk are characterized by their equal-value nature, offering the distinct advantage of facilitating transparency in determining investors' shares and distributing returns.
2. **Common Shares in Ownership:** Sukuk, as financial instruments, embody the collective ownership of either pre-existing or prospective assets, with the subscription proceeds encompassing potential advantages, tangible assets, rights, or a combination thereof.
3. **Participation Basis:** Islamic Sukuk function based on the principle of profit and loss sharing, operating on a participatory basis. These Sukuk are issued in accordance with different Islamic finance contracts, such as Murabaha, Ijara, and Mudaraba, and strictly adhere to Sharia-compliant contracts and their respective regulations.
4. **Registered Ownership:** According to Islamic Sharia principles, the ownership and transferability of Sukuk lie with the subscribers, who are registered as the rightful holders and possess the authority to exercise control over them.
5. **Non-Tradable Types:** Trading of certain types of Sukuk is not permissible under Sharia, thereby limiting their tradability in the market.

3 The Method of Issuing Islamic Sukuk

The process of issuing Islamic Sukuk is of utmost importance and necessitates careful consideration of various factors outlined in the issuance prospectus, encompassing Sharia compliance, the procedural nature of the issuance, and the provision

of comprehensive information and data to prospective subscribers in order to ensure alignment with all investors.

Islamic securitization can be carried out in one of two ways:

3.1 Direct Method or Simple Securitization

The issuance of Sukuk is utilized as a means to generate funds for a particular investment endeavor, such as projects pertaining to public utilities. This process involves the issuance of Sukuk in accordance with diverse Islamic financing structures within the primary market. The cumulative sum obtained from the subscriptions serves as the capital for the designated project.

3.2 Indirect Method or Private/Structured Securitization

The process entails the issuance of Sukuk in order to transform preexisting projects or assets into readily available funds. This conversion necessitates the transformation of income-generating assets into equivalent units, each representing the value of a Sukuk. Subsequently, these units are made available in the financial market with the aim of generating capital [18].

Although there are similarities in the overall structure and issuance procedures of Sukuk, variations exist as a result of the underlying contract upon which the Sukuk are founded. Consequently, this chapter will provide an overview of the general issuance mechanism of Sukuk, followed by comprehensive explanations of the distinct types of Sukuk discussed in subsequent sections.

The steps for issuing Sukuk can be sequentially outlined as follows:

1. **Collection of Assets to be Securitized**: In order to transform leased assets or diverse forms of loans into Sukuk and subsequently offer them to investors, it is necessary to assemble a collection of various asset types within the securitization portfolio [18].
2. **Preparation of the Issuance Prospectus**: In accordance with Sharia-compliant and legal regulatory standards, it is necessary to prepare an issuance prospectus that provides a comprehensive and thorough overview for potential investors seeking to subscribe and invest in Islamic Sukuk. This prospectus should establish a clear administrative and technical framework for the issuance process, outlining the rights and responsibilities of all relevant parties [7]. The Jordanian legislator has made it clear that the prospectus must contain a number of information including that the issue should adhere to the Islamic Sharia principles in the issuance, the amount of money being raised, whether feasibility studies have been conducted (and what they entail), and reasons for initiating or expanding project. It should also set deadlines for completion plus mention

other regulatory matters connected with subscription procedures and mechanism regarding disputes' resolution, not forgetting rights of Sukuk holders. Also, it must elaborate on methods used in Sukuk extinguishment, details relating to all these aspects are presented in the document called "Issuance Prospectus" as defined under Islamic Finance Sukuk Law No. 30 (2012) [16]. The provision defines this document as containing all data related to conditions and terms of Islamic finance Sukuk issuance.

3. **Establishment of a Special-Purpose Vehicle (SPV)**: One of the suggestions in facilitating Sukuk issuance is by creating a Special-Purpose Vehicle (SPV), wherein the capital of a project, existing or planned, is divided into equal Sukuk units and then sold to Sukuk holders. The SPV, which is initiated by the Sukuk issuer, acts as an independent legal body tasked with ownership of the securitized assets. This was stated in Ben Aldaif's work in 2017. By operating independently from the Sukuk issuer, the SPV ensures the safeguarding of assets owned by the Sukuk holders [6]. According to the Islamic Finance Sukuk Law No. 30 of 2012, the SPV is defined as a company specifically established for the purpose of owning the assets and associated benefits that underpin the issuance of Islamic finance Sukuk. During the period when the issuer's assets are no longer recorded on their books and until the issuance of financial documents related to these assets, it is necessary for these assets to be held by an independent legal entity known as the custodian. This entails the establishment of a company without a direct owner, which serves the purpose of owning the assets and issuing financial documents based on them. The duration of this company's existence is directly linked to the maturity of the aforementioned financial documents. The Special-Purpose Vehicle (SPV) assumes responsibility for safeguarding the interests of investors, ensuring satisfactory returns, and facilitating the recovery of their funds upon maturity [8].
4. **Transfer and Sale of Sukuk**: Upon the transfer of assets to the Special-Purpose Vehicle (SPV) and their subsequent conversion into Sukuk of equivalent value, the SPV proceeds to sell these Sukuk through a subscription process. Investors willingly subscribe to these Sukuk and provide the corresponding cash value to the SPV, which functions as the representative for the Sukuk holders. In return for the paid value, the SPV delivers the Sukuk to the holders and remits the Sukuk value to the issuer [10]
5. **Sharia-Compliant Payment**: When remunerating the issuer for the value of the Sukuk, it is imperative to take into account the specific Sharia format under which the Sukuk were established. For instance, in partnership Sukuk, the issuer assumes the role of a partner and contributes either cash or in-kind, with clearly defined shares allocated to both the Sukuk holders and the partner. In Mudaraba Sukuk, the issuer acts as the mudarib (manager), while the Special-Purpose Vehicle (SPV), acting as an agent for the capital owner, disburses the funds to the mudarib subsequent to the establishment of the Mudaraba agreement with the issuer. In the case of Murabaha Sukuk, once the Sukuk value is collected, the SPV promptly procures the commodity from its supplier and immediately settles

the payment, allowing the buyer (issuer) to acquire the commodity at a predetermined profit margin. As for Ijara Sukuk, upon collection of the Sukuk value, the SPV procures and assumes ownership of the leasing assets, subsequently leasing them out for agreed-upon periodic payments [10].

6. **Ownership and Transfer of Sukuk**: Once Sukuk have been acquired by Sukuk holders, they grant complete ownership of a proportionate stake in tangible assets, enabling holders to divest them and transfer them using legally mandated methods such as sale or mortgage [3].
7. **Management of Sukuk Portfolio**: During the duration of the Sukuk issuance, the SPV undertakes the responsibility of overseeing and managing the Sukuk portfolio on behalf of the investors. It assumes the task of collecting regular returns from the underlying assets and subsequently disbursing them to the investors [6]. On the designated dates for periodic distribution, the SPV allocates the profits, if any, to the Sukuk holders based on their respective participation shares in the project [10].
8. **Sukuk Redemption**: Upon the conclusion of the Sukuk tenure, or upon its redemption on the specified date as outlined in the issuance prospectus, the value of the Sukuk is disbursed. This disbursement can occur either through the allocation of the project to the Sukuk holders or through the liquidation of the project by means of sale, with the proceeds being distributed in accordance with the proportionate share of each holder [18].

The nominal value of Sukuk at the time of redemption may fluctuate, either increasing or decreasing, due to its composition of both the principal and potential profits. The principal represents the nominal value and has the potential to generate capital gains if the market value of the Sukuk increases, in addition to the periodic profits distributed during the issuance period. Consequently, the principal can remain unchanged, appreciate in value through capital gains, or depreciate in case of losses at the end of the specified period. The redemption of Sukuk can be executed through various methods, such as liquidating the project, wherein Sukuk holders receive their rightful shares in proportion to their capital contributions. Another approach involves estimating the project's value through expert evaluation and distributing the calculated results to the Sukuk holders. Alternatively, assets may be transferred to holders at a nominal price, as a gift, or at the remaining value, as seen in Ijara Sukuk with ownership transfer [10].

The process of redemption can also take place through liquidation and a single payment to the holder upon reaching maturity, encompassing the repayment of the Sukuk value and profits. Alternatively, periodic redemption can be implemented by disbursing a return to the Sukuk holders, which is divided into two components: the first component represents profits, while the second component serves for the partial redemption of the Sukuk and the recovery of the principal value [4]

4 Parties Involved in the Sukuk Issuance Process

The issuance of Sukuk, a type of financial instrument compliant with Sharia principles, is based on various Sharia-compliant investment contracts such as sale, Ijarah, Mudarabah, and others. The issuance contract involves two main parties: the issuer of the Sukuk and the subscribers. The nature of their relationship is determined by the specific investment contract and its adherence to Sharia principles. As soon as the contract is concluded, the rights and obligations between the parties come into effect. In terms of offer and acceptance, there are three perspectives. The first perspective considers the issuance prospectus as the offer, and the acceptance occurs when subscribers subscribe to the Sukuk and pay its value. The second perspective, supported by the Islamic Fiqh Academy, views the offer as the act of subscribing to the Sukuk, and the acceptance is the approval of the issuing entity to allocate the Sukuk to the subscribers. The issuance prospectus in this perspective serves as an announcement that provides information about the contract terms and conditions. The third perspective, outlined by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), regards the issuance prospectus as an invitation to subscribers. The offer is represented by the subscription to the Sukuk, and the acceptance occurs when the issuing entity approves the allocation of the Sukuk. (International Islamic Fiqh Academy, Decision 5, Fourth Conference—Jeddah, 1988 [6, 14]).

The main parties involved in the issuance of Islamic Sukuk are:

1. **Sukuk Issuer**: The entity in question is responsible for soliciting funds and allocating the generated revenue towards activities that adhere to Sharia principles. The issuer of these funds can encompass various entities, such as governmental bodies, private corporations, financial institutions, or even individuals [10].
2. **Special-Purpose Vehicle (SPV)**: Typically, the role of this particular entity involves acting as an intermediary for the Sukuk issuer, acquiring the assets that are to be included in the Sukuk issuance through a structured securitization process. Alternatively, it may serve as an agent for the Sukuk issuer in a more straightforward securitization arrangement, governed by an investment agency contract [3].
3. **Sukuk Holders**: The individuals or entities referred to as investors or capital owners are the ones who acquire Sukuk through the process of subscription. By doing so, they obtain financial documents that serve as evidence of their shared ownership in the project, entitling them to a proportionate share of its profits and losses based on their respective ownership stakes. These Sukuk holders can encompass a wide range of entities, including government bodies, banks, individuals, and financially robust institutions seeking to optimize their surplus liquidity and attain comparatively lucrative returns [17].
4. **Sukuk Manager**: The entity responsible for representing the Sukuk holders and overseeing the assets owned by them is commonly referred to as the Sukuk manager. In many cases, a Special-Purpose Vehicle (SPV) is appointed to carry out the securitization procedures on behalf of the Sukuk holders, in exchange

for a predetermined commission or fee as outlined in the issuance prospectus. The relationship between the Sukuk manager and the Sukuk holders is typically governed by an agency contract, wherein the manager acts as an agent for a specified fee [5]. Sukuk can be managed through various structures such as Mudarabah, partnership, or agency, with a designated Mudarib, manager, or agent overseeing the management process [6].

5. **Issuance Agent**: The intermediary institution, acting as a representative for both the issuer and the Sukuk holders, assumes responsibility for carrying out all necessary procedures related to the issuance and management of the Sukuk. These procedures encompass tasks such as organizing the issuance prospectus, registering it, listing it for trading, settling it, and ultimately ensuring its termination at the conclusion of the agreed term, all in exchange for a predetermined fee as stipulated in the issuance prospectus [17].
6. **Issuance Trustee**: The oversight of the issuance manager and the preservation of Sukuk holders' rights are delegated to this middleman entity. Furthermore, it takes charge of safekeeping important documents and assurances with a fee detailed in the issuance prospectus, collected as per an agency agreement [10].
7. **Investment Manager**: The actor who undertakes the investment actions is the one named by the party issuing the Sukuk according to the issuance prospectus [17].
8. **Sharia Supervisory Board**: Their main role is Sharia compliance oversight in Sukuk. It covers looking at the Sukuk's structure, documents and contracts; relationships through Sukuk's trade and termination procedures. All activities and operations related to the project must be presented to the Sharia Supervisory Board for their evaluation and determination of Sharia compliance [10]. Additionally, the board establishes the Sharia standards that govern the securitization process and may require an independent entity to monitor the issuer and investment manager's adherence to these standards [3]. The appeal of Islamic financial transactions lies in the participants' genuine desire to ensure that their financial dealings align with Sharia principles and avoid usurious transactions. Consequently, the presence of a specialized Sharia board becomes imperative to provide authoritative opinions and fatwas on all investment activities, thereby instilling confidence among existing investors and attracting new investments.
9. **Global Rating Agencies**: In the process of securitization, specialized agencies hold the responsibility of evaluating the credit and financial rating of Sukuk. This assessment serves to determine the creditworthiness and financial stability of the Sukuk that will be issued, including any associated guarantees and risks, as well as establishing their fair price. Certain regulations governing securitization mandate the acquisition of a credit rating certificate for the asset being securitized. Notable examples of these agencies include the Islamic International Rating Agency (IIRA) in Bahrain, Standard & Poor's, and the Malaysian Rating Agency (RAM) [17].

The expertise of credit rating agencies is of utmost importance in facilitating the securitization process [8]:

- They verify the credit quality of the securitized asset, which significantly affects the income generated by Sukuk holders.
- They help the issuer sell Sukuk at the right price.
- They clarify the borrower's ability to repay, reducing investment risk.
- Investors trust their assessment of the credit quality of the security because they are completely independent institutions with no direct interest in investing or issuing securities.

5 Study Results

The findings of the study pertaining to the mechanism of issuing Islamic Sukuk and the entities engaged in the securitization process unveil various facets that have a direct influence on the efficacy of these financial instruments. Primarily, it was observed that the formulation of Sukuk is predominantly dependent on Sharia-approved contracts, including Murabaha, Ijarah, and Mudarabah contracts. These contracts guarantee the adherence of Sukuk to the principles of Islamic Sharia, consequently enhancing their attractiveness to investors in search of Sharia-compliant investment opportunities.

Furthermore, it was determined by the research that the process of securitization encompasses various essential stakeholders who perform crucial functions in the issuance of Sukuk. These stakeholders include the regulator or issuing entity responsible for establishing the terms and issuing the Sukuk, the investors who acquire the Sukuk, and the Sharia advisors who ensure the Sukuk's adherence to Sharia principles. Furthermore, there exist other related parties like agents and fund managers, taking care of Sukuk investments' management on behalf of investors, along with underwriters who ensure subscription coverage by pledging a guarantee in situations where demand from investors is insufficient.

The study results pointed out the importance of a strong regulatory environment in Sukuk issuance. Having an operational legal and regulatory system that would ensure transparency, as well as the protection of the interests of all parties involved, is highly necessary. Moreover, a clearly outlined regulatory framework is able to instill confidence among investors (to be noted from their side) and establish trust with issuers on a reciprocal basis, thus acting for long-term sustainability of Islamic Sukuk market through positive business environment. As these intertwined elements play their respective roles, it leads towards building a dynamic marketplace. This is not just for Sukuk but Islamic Finance in totality which can meet varying financial needs from different economies with diverse dimensions effectively.

5.1 Recommendations

Based on the findings, the researcher recommends the following:

- The advice is to start awareness and educational campaigns for the purpose of increasing the level of information available to the Islamic Sukuk investors and financing institutions about the issues, benefits, and procedures related to Islamic Sukuk. The programs might involve workshops or training courses as well as e-learning platforms.
- It is recommended to perform periodic reviews on Jordan's legislative and regulatory framework governing Islamic Sukuk, ensuring that they facilitate clarity of regulations through Sharia compliance. Also, simplifying administrative processes like removing duplications and enhancing coordination among regulators in support of such initiatives is recommended as well.
- Joint committees or regular meetings are suggested to be formed between the parties in the securitization process – government, financial institutions, regulators and Shariah advisors. These committees can help improve coordination, exchange experiences and resolve issues that may arise during the Sukuk issuance process.

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The Effect of E-Performance Evaluation on Talent Management: A Conceptual Model



Hanady Al-Zagheer, Qais Kilani, Qais Hammouri, and Ayad Fadhil Altememi

Abstract Electronic management is considered one of the products of the knowledge economy, which came as an inevitable necessity to keep pace with the various types of developments that the institution has known, as its application has a significant impact on the institution's performance. The survival and continuation of the institution in an era of revolution in the world of information and communications technology have become linked to the extent to which the institution applies the elements of electronic management and what Because human resources are considered the basic pillar of an organization, measuring the impact of using electronic human resources management on job performance was the subject of this study. By relying on presenting a proposed model that helps understand the importance of using e-performance evaluation in talent management.

Keywords E-performance · Evaluation · Talent management · Human resource management

1 Introduction

Simply having a Human Resources department does not equate to effective talent management. A tailored talent management strategy that aligns with your company's specific needs is essential to achieve the best outcomes. Talent management's employee-centric approach maximizes the potential value of your workforce. By hiring and nurturing skilled employees, your organization becomes more robust and resilient, better equipped to adapt to changes and navigate potential risks. Additionally, employees with advanced skills are better equipped to leverage new technologies, solve problems creatively, and innovate. This investment in human capital can

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thus be a significant driver of your company's success [1]. However, this paper will explore the impact of digital performance appraisals on managing talent. Performance appraisal is the evaluation process that assesses how effectively individuals meet their job roles and contribute to achieving organizational goals. It encompasses a method of measurement, an observation and judgment exercise, and a mechanism for providing feedback. Performance arises from the interplay of an individual's motivation and capabilities, along with contextual elements that can either enhance or hinder employee performance potential [2]. Implementing talent management can present difficulties, such as dealing with supervisors who lack the inclination to support their staff, employees who do not show initiative, and those who are ill-suited for their roles within the company [3, 4].

Attracting and retaining employees is not a task that should fall exclusively on the shoulders of the human resources department; rather, it is a responsibility that should be integrated across all levels of the organization. It is crucial for line managers to take an active role in nurturing the skills of their immediate reports as it aligns with business strategy. To facilitate a comprehensive understanding of the organization's broader objectives, there should be a culture of transparency where different sections within the company freely exchange information among themselves [5]. In understanding organizational performance, professionals are required to establish a well-defined rationale for comprehending the essence of performance and the criteria that will be utilized for its evaluation. When determining the meaning of performance, managers must take into account all stakeholders involved, the level of environmental uncertainty, available resources, strategic choices made by the organization, and temporal factors [6].

While the concept of organizational performance is broad, comprehending its definition through components like financial outcomes, market position, shareholder returns, and sustainability can assist a professional in selecting the appropriate mix of indicators for measurement. Different indicators are employed at multiple levels to gauge the success of an organization [7, 8]. In the ever-evolving business landscape, traditional resources such as fixed assets, land, and capital are no longer the sole factors for creating a long-term competitive advantage and enhancing company performance. Instead, the workforce, or organizational capital, has become the most vital asset. The array of talents and capabilities that employees bring to a company have led them to be regarded as the fundamental resource of production and are often termed as the firm's human resources [9].

Current trends highlight human resources as a company's most critical asset, recognizing employees as the organization's pool of talent and giving rise to the concept of talent management. Talent management is a strategic approach to identifying, acquiring, fostering, retaining, and rewarding capable individuals. This approach can endow organizations with the intelligence, adaptability, and competence required to surpass competitors. By concentrating on attracting, cultivating, and keeping talented staff and channeling their collective efforts, a firm can strengthen its bundle of resources. Furthermore, since exceptional talent constitutes an intangible resource with depth and diversity that cannot be easily copied or replicated by rivals, it solidifies business success and creates a sustainable competitive advantage.

Organizations are thus advised to hire, develop, and maintain remarkable employees who are instrumental in achieving these advantageous outcomes [10]. TM is closely related to performance appraisal as a tool for the development of the organization, as the high levels of employee evaluation are mainly due to the management of special talents in the management of the organization and its methods of investing human capital, which is an internal factor in the organization where it can be controlled in contrast to external factors that prove the extent The presence of TM and the organization's maintenance of high levels of evaluation (distinguished employees).

2 Literature Review

2.1 E-Performance Evaluation

The electronic performance management system is a critical tool utilized by human resources departments across organizational hierarchies—from top-level executives to entry-level employees on production lines. It serves as an efficient mechanism for administrative oversight, allowing for the comparison of employees' actual performance against predefined goals and objectives. This system encourages departments to function with vigor and motivation due to the ongoing assessment of employee performance by their managers. It also drives employees to excel in their roles and be seen as productive by their superiors, as it is often linked to performance-related rewards such as incentives and bonuses. To ensure the effectiveness of this process and achieve its intended outcomes, a methodical and precise approach is necessary, along with the involvement of all stakeholders who stand to benefit from the insights gained through the evaluation process [11].

Electronic performance evaluation is a pivotal process for defining an individual's work proficiency and establishing plans for performance enhancement across various instances. When properly implemented, performance appraisals not only reflect an employee's current performance standards but can also influence their dedication and the trajectory for upcoming tasks. Furthermore, such evaluations play a supportive role in appropriately channeling efforts towards performance improvement, ensuring that employees have a clear understanding of their strengths and areas needing development. E-performance evaluation refers to the digital administrative procedure used to assess the effectiveness of employees and the degree to which they contribute to their assigned tasks. This process involves evaluating worker behaviors and actions during their job duties and measuring the progress they make over time.

There are many best practices in developing and evaluating E-performance, including defining and updating clear, achievable, tangible, and measurable goals. Improving communication and cooperation between management and employees [12]. Evaluate performance regularly and transparently using standard tools and indicators. Providing training and development to employees through workshops and training courses to improve their skills and enhance their performance. Promoting

positive interaction and appreciation of achievements through appreciation and performance evaluation based on employee positivity. Encouraging employees to be creative and finding solutions to improve the production process. Providing a clear path plan for employees and directing appropriate treatment to develop their skills and services. Listen to employee complaints and observations and deal with them professionally and fairly [13].

2.2 Talent Management

In today's business world, firms across all industries rely on various forms of artificial intelligence. AI is widely recognized by both academics and practitioners. Given the rapid technological advancement that has linked the entire planet into a single network, businesses will be guided by the technologies of the future [14]. However, it should be mentioned that gaining a competitive edge is not just about knowing the client and what he wants; it's also about making solutions that meet those wants and needs so that the customer is happy and loyal to the business [12].

Talent management is the competency of an organization to attract, keep, and develop exceptionally skilled workers from the job market. It has been demonstrated that talent has a positive impact on several vital economic indicators, such as revenue, customer contentment, quality, productivity, costs, process duration, and market value. Effective talent management involves leveraging employees' skills, knowledge, cognitive abilities, and potential for high performance. This capability is essential for individuals in the job market to develop.

While it is feasible to identify gifted individuals, the real test lies in ensuring their long-term commitment to the organization. Top talent, due to their high proficiency and performance level, are in demand, and companies aim to retain them for extended periods. Nonetheless, these highly skilled individuals may either be content in their current roles or could be on the lookout for more advantageous opportunities elsewhere [15].

2.3 Talent Management and Competitive Advantage

Human capital is universally recognized as the bedrock of competitive advantage in businesses around the globe. Personnel are invaluable to a company, as they are responsible for conducting research, devising strategies, designing projects, and creating distinctiveness in the market. Indeed, the workforce is the singular authentic asset within any enterprise, driving growth, seizing market opportunities, enhancing organizational capacity to fulfill ambitions, and mitigating prospective challenges in the corporate world. Understanding the role of human resources is pivotal in acknowledging its status as a core element in establishing a competitive edge.

"Competitive" in this scenario pertains to an organization's proficiency in capturing a greater market segment within their respective industry. Achieving such an advantage through human capital is a complex endeavor, necessitating not only the attraction of skilled individuals but also investing in their professional growth and talent development [9].

2.4 Effect Talent Management on Organizational Performance

The impact of Talent Management on organizational performance is often influenced by the level of investment in Human Resource Management. The effectiveness of TM can vary based on factors like the prevailing organizational culture and the HRM strategies in place. For instance, the relationship between TM practices and organizational outcomes might differ significantly in an environment where a select few top talents are prioritized and given exclusive benefits without supportive measures for the broader workforce, compared to a setting where resources and opportunities are more uniformly distributed among employees [16, 17].

A key driver of organizational innovation is the ability to both generate and actualize novel ideas. For this innovation to occur, it's essential to facilitate the transfer of knowledge from individuals to groups, allowing for the creation of new and combinatorial knowledge pools. Human capital elements such as knowledge, expertise, and competencies are extremely valuable assets. Consequently, the generation of fresh knowledge and the fostering of innovation are vital for a company's competitive edge and longevity [14].

3 The Proposed Model Dimensions

3.1 Talent Term

Talents imply people as individual and are today characterized as vital for a company's sustainable competitive advantage and maximizing organizational performance. A talent is typically said to be difficult to copy, imitate and to substitute. In the workplace, the concept of talent generally refers to individuals who possess innate skills that are above average, allowing them to perform at a higher level than their peers. It can also be used to identify a collective of employees and potential hires who demonstrate exceptional performance and high caliber in their roles [18, 19]. Securing talent that consistently exceeds expectations is central to organizational success. Essential traits to identify in potential hires include individual self-motivation manifesting as pride and autonomy in work, the ability to enhance team dynamics with excellent communication skills, a results-driven mindset with

a penchant for achieving goals, innate leadership that garners trust and encourages colleagues, and creative thinking that propels innovative problem-solving and workplace efficiency [20].

3.2 Evaluation

Evaluation is a crucial tool for better management. The efficiency of an organization is measured in terms of its functioning, problems, and successes through organizational assessment, also known as evaluation, from both the behavioral and social system perspectives [21]. "Measurement of factors relevant to patterns of organizational behavior and effectiveness" is what organizational assessment entails. It can help managers enhance their operations' efficiency and effectiveness and build public backing for research programs and outreach activities [22].

3.3 Competencies

The abilities necessary for an organization to thrive and maintain market competitiveness are known as organizational competencies. They consist of expected behaviors, skills, and attitudes that contribute to efficient organizational performance and are heavily dependent on the capabilities of the organization's workforce. Competencies encompass the combination of knowledge, skills, innate abilities, and observable actions that are key to personal and organizational achievement. Knowledge is the understanding acquired through learning, experiences, or research. Skills are developed through consistent application of this knowledge or expertise. Talent refers to the natural aptitude for performing certain mental and physical activities. Behavior is the action an individual displays in response to specific situations. The required proficiency level of each competency differs based on the role of the person and the objectives set forth by the organization [23].

3.4 Talent Marketplace

People are matched to opportunities and potential employment in a talent marketplace based on their talents, interests, and preferences. It can also connect employees with on-the-job learning opportunities that will allow them to gain new skills or practice those they already have. An ideal talent marketplace evaluates the whole person, including their skills and competencies, but also looks at things like interests, work styles, and learning preferences, among other things. The marketplace expands people's knowledge beyond their abilities to what they want to do and how they like to do it. A talent marketplace allows people to grow and thrive while

also providing employers with the information they need to future-proof their staff [24]. Today's Talent Marketplace resembles a "career management" system in that it allows people to promote their skills and aspirations, provides tools for finding mentors and learning, suggests projects and assignments of interest, and manages the search, hiring, onboarding, and movement of people from role to role. As a platform, the talent marketplace is the future of "Talent Management." This system manage absorbs everything we do to manage people.

4 Discussion

Human resources are at the heart of an economic entity's effectiveness and is pivotal for achieving and excelling at organizational goals. It carries significant weight in shaping organizational strategy and endeavors by providing agility, innovative capability, and proactiveness. Consequently, it stands as the dynamo that propels the institution forward. Consequently, human resource management plays a critical role in the synchronization of individual competencies with job requirements, which is vital for overall organizational functioning.

The congruence between employee abilities and their respective roles substantially influences their performance levels, job satisfaction, and related aspects of human resource management. Central to this management domain is the focus on selecting and educating staff, alongside the significant and intricate task of performance appraisal. The performance of team members within an organization is dynamic, necessitating that management constantly monitors, assesses, and refines it. This ensures the enhancement of strengths and the timely rectification of weaknesses.

Therefore, organizations are advised to use electronic evaluation because of its benefits, the most important of which are works to develop administrative procedures and processes in accordance with management objectives. Getting rid of bureaucracy in electronic administrative work and supporting Transitioning to decentralized management by further developing the entity's organizational structure the effectiveness and efficiency of the organization. Involving employees in the decision-making process in their field of work through electronic systems and stimulating the spirit of creativity and self-development among them. Aligning electronic performance systems operations with actual business needs, paying attention to the communication network to ensure that systems respond quickly to commands required, and develop the systems to include all tasks and procedures. Eliminating paper transactions and paying attention to increasing the protection feature and security on systems.

5 Conclusion

Given the complexity of the E-performance appraisal process, errors sometimes occur that make it less efficient. Therefore, we have collected in the following list the most common performance evaluation mistakes for you to avoid halo effect, it is one of the most common mistakes, and it means generalizing one of the employee's characteristics, whether positive or negative, to all other aspects of the evaluation without carefully examining each aspect individually. Personal bias which means lacks objectivity and is based on intuition—whether consciously or unconsciously—rather than on facts or logic. Generalization, that is the use of stereotypical ideas about a group to classify the performance of an employee who belongs to this group, with the automatic assumption that he shares the same characteristics as others in the group. The generalization may be related, for example, to gender, country, religion, etc. Recently of appraisal, this error occurs when a manager bases his appraisal only on the most recent workweek, whether the employee's performance has always been excellent, but he made a mistake just before the appraisal, or vice versa. Diversity of standards, the error of diversity of standards arises when the manager evaluates the performance of employees based on different, subjective criteria between one employee and another who performs the same role, which makes the evaluation lack the simplest principles of fairness. Strictness and softness, this error occurs when the manager is strict or soft by nature. For example, he is strict when most employees rate him below average, or vice versa, he is lenient when most of them rate him above average. Tendency to mediocrity, where some managers tend to evaluate all employees with average ratings overall, so no one has an excellent or poor rating.

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Enhancing Financial Integrity: The Role of Accounting Information Systems in Mitigating Creative Accounting Practices Among Industrial Companies Listed on a Stock Exchange



Ziad Abdul Haleem Altheebeh and Braa Adel Alqaise

Abstract The objective of this research is to examine the influence of the accounting information systems (AIS) on the reduction of unethical practices associated with creative accounting in industrial firms that are publicly traded on the Amman Stock Exchange (ASE). The sample for this study comprises a total of 33 industrial companies listed on the ASE. The independent variable is assessed using a specific questionnaire administered to the participants, while the dependent variable is measured using primary sources, namely the annual financial reports of Jordanian industrial companies from the years 2015 to 2021. The findings of this study reveal a statistically significant adverse impact (in terms of both human resources and physical resources) and a statistically significant positive impact (pertaining to laws and regulations) on the mitigation of unethical practices related to creative accounting within industrial companies listed on the ASE. Based on the results obtained, several recommendations have been put forth, such as the need to allocate more resources towards human capital development within companies, as well as the promotion and enforcement of accounting-related laws, regulations, financial reporting, and transparency within these organizations.

Keywords Accounting information system · Creative accounting · Industrial companies · ASE

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1 Introduction

Numerous organizations endeavor to enhance their financial standing, augment profitability, and attain their strategic goals [1, 2]. Nevertheless, in cases where these desired outcomes are not achieved, accountants may resort to the manipulation of financial data and the alteration of figures portrayed in financial statements, thereby presenting an unfair and inaccurate representation [3]. Consequently, this practice, commonly referred to as negative creative accounting, misleads users of financial statements. In recent years, a prevailing trend among companies worldwide has emerged, wherein computerized AIS are widely employed and further developed [4]. This is attributed to their effectiveness in providing financial data and statements, streamlining processes, and facilitating access to financial information through various accounting software programs [5, 6].

The utilization of AIS is essential in preventing the occurrence of negative creative accounting practices [7–9]. These systems consist of various components, including human resources at different levels of administration and technical expertise, such as accountants, auditors, decision-makers, programmers, and system designers [10, 11]. Additionally, physical resources and IT infrastructure, encompassing communication means, devices, equipment, and buildings, are integral to these systems [12, 13]. Moreover, legislation, instructions, and laws, such as accounting principles, financial reporting standards, state tax regulations, and directives from regulatory bodies like corporate watchdogs, central banks, and board directives, contribute to the functioning of these systems [14, 15].

The rise in negative creative accounting practices has resulted in the downfall of numerous companies, exerting a detrimental impact on the economy and raising concerns regarding the objectivity and trustworthiness of financial data provided to users [13, 16, 17]. Consequently, AIS play a significant role, whether actively or passively, in both implementing creative accounting practices and safeguarding the economy. Furthermore, these systems ensure the objectivity and credibility of financial data [14, 15, 18–21].

1.1 Study Variables

See Fig. 1.

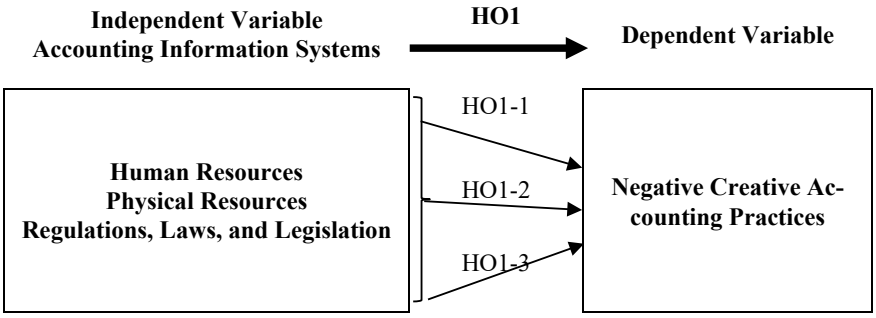


Fig. 1 Study variables

2 Theoretical Framework

2.1 Accounting Information Systems (AIS)

In recent times, there has been a rapid advancement in the field of information systems, which heavily relies on technology [22, 23]. The integration of modern systems in the preparation of AIS has become necessary, considering its significance in economic entities. This shift is indispensable [24]. It keeps pace with innovations, ensuring the provision of correct information. This information, in turn, eases appropriate decision-making as well as its timeliness [1].

Alicia [2] brought out the importance of an AIS in collecting, storing and processing financial and accounting data. The use of this data by internal users ensures that information is relayed to investors, creditors and government authorities. AIS is a computer-based system widely recognized among accounting circles for marrying age-old accounting practices (such as compliance with GAAP) to modern technology [3]. Aoun Allah and Blaik [4] offered their definition as well, depicting AIS as a subsystem stemming from enterprise information systems. They specialize in accounting operations by providing financial reports: these reports are instrumental in facilitating timely decision-making for both internal and external stakeholders. Moreover, Al-Ramahi [5] highlights that AIS does have another critical function aside from just providing those important reports: it plays a significant role towards activating and sustaining any organization's good control environment measures.

2.2 Creative Accounting

The term "creative accounting" has gained significant traction in the realm of accounting and auditing especially post the Enron scandal era. The collapse of Enron shed light on Arthur Andersen, the auditing firm that was supposed to be keeping a check on Enron's financial statements. However, it was found wanting in its duties

and partly blamed for the downfall of the company. Arthur Andersen was accused of resorting to manipulative accounting practices whereby they used certain treatment and policies under accounting that would distort Enron's financial data, consequently, misrepresenting their actual financial standing [6, 16, 17].

Scholars like [7] or [8] point out that creative accounting entails using various techniques intended to mislead users about a company's true financial picture as these methods aim at camouflaging actual details concerning an organization's financial health by taking advantage of flexibility plus changes surrounding standards and systems within accounting. Moreover, creative accounting involves accountants using their cognitive capabilities to tweak numbers with a purpose [9, 10]. Typically, these actions run counter to the laws, principles, or standards of an organization's accounting arm. Keep in mind that such acts fly in the face of professional ethics; though creative accounting practices might seem within the bounds of legality, they are fundamentally unethical.

3 Study Methodology

In order to assess the effectiveness of the AIS in reducing instances of creative accounting within industrial companies listed on the ASE, this study employed a descriptive-analytical methodology.

3.1 Study Population and Sample

The sample for this study consisted of a total of 33 industrial companies that are publicly listed on the ASE. In order to assess the independent variable, a specifically designed questionnaire was created and administered to individuals within the research participants who represented the study population. These individuals included financial managers, heads of accounting departments, accountants, auditors, and employees in the IT department. A total of 300 questionnaires were distributed, resulting in the retrieval of 231 electronic questionnaires, indicating a response rate of 77%. Alongside the questionnaire, the dependent variable was measured using primary sources, specifically the annual financial reports of Jordanian industrial companies from the years 2015 to 2021.

3.2 Study Variables

The variables associated with the influence of the AIS, namely human resources, physical resources, laws, and legislation, were identified in the study. To measure the independent variable, a questionnaire consisting of 35 statements was utilized,

distributed across three dimensions. Furthermore, the dependent variable focused on the reduction of unethical practices related to creative accounting in industrial companies listed on the ASE. This was assessed using the earnings management model proposed by Dechow et al. [11], which can be represented by the following formula:

Firstly: Determining the total receivables value

"Tait = Net Income it − OCF it (Operating Cash Flow)"

Secondly: Estimating the slope (a0 + a1 + a2 + a3) to calculate non-discretionary accruals, by building the regression model as follows:

$$\text{“}\frac{TA_t}{A_{t-1}} = a_0 + a_1\left(\frac{1}{A_{t-1}}\right) + a_2\left(\frac{\Delta Rve_t - \Delta Rect_t}{A_{t-1}}\right) + a_3\left(\frac{PPE_t}{A_{t-1}}\right) + £_t''$$

TA_t: Total receivables of company (i) in year t

A_{t-1}: Total assets at the end of the previous year

ΔRve: Change in company (i)'s revenues between years (t) and (t − 1)

ΔRect: Change in company (i)'s accounts receivable between years (t) and (t − 1)

PPE_t Size of company (i)'s property, plant, and equipment in year (t)

£: Error term in the regression equation.

Thirdly: Estimating non-discretionary accruals by compensating for expected values, which were extracted from the previous regression equation for each company individually and during each study year, as follows:

$$\text{“}NDA_t = a_0 + a_1\left(\frac{1}{A_{t-1}}\right) + a_2\left(\frac{\Delta \text{ Rve }_t - \Delta \text{ Rect }_t}{A_{t-1}}\right) + a_3\left(\frac{PPE_t}{A_{t-1}}\right) + £_t''$$

$NDA_{i,t}$ Non-discretionary accruals of company (i) in year (t).

Fourthly: After estimating total accruals and non-discretionary accruals, discretionary accruals are calculated by:

$$\text{DA i, t} = \text{TA i, t} - \text{NDA i, t}$$

DA i, t: discretionary accruals for company i, in year t.

NDA i, t: Non-discretionary accruals of company (i), in year (t).

TA i, t: Total receivables of company (i), in year (t).

The assessment of creative accounting practices in industrial companies is conducted by calculating the absolute value of the average discretionary accruals over the study period for all companies and contrasting it with the absolute value of the arithmetic mean of discretionary accruals for each company during the study years. If the arithmetic mean of discretionary accruals for a specific company (i) exceeds the overall arithmetic mean of discretionary accruals for all companies in the study sample, it signifies the presence of creative accounting practices. Conversely, if the arithmetic mean of discretionary accruals for a specific company (i) is lower than

Table 1 Multiple regression results for hypothesis testing

Dependent variable: reducing negative creative accounting practices in industrial companies listed on the ASE			
Independent variable	B	T	Sig.
Constant	0.958	1.819	0.07
HR	− 0.355	− 2.19	0.03**
Physical resources	− 0.361	− 2.506	0.013**
Rules and regulations	0.272	2.14	0.033**
R^2	50.70%		
F	7.565		
Sig	0.000***		

the overall arithmetic mean of discretionary accruals for all companies, it indicates the absence of creative accounting practices.

Based on the data presented in Table 1, it becomes apparent that the dimensions of the AIS have a significant impact on reducing the occurrence of creative accounting practices in industrial companies listed on the ASE. This impact was measured using the earnings management model. Furthermore, the coefficient of determination (R^2) was calculated to be 50.7%, indicating that the variables of human resources, physical resources, and laws and legislation collectively account for 50.7% of the variability observed in the occurrence of negative practices of creative accounting in Jordanian industrial companies.

The regression model was statistically significant, with a significance value for the F-statistic ($F = 0.000$) less than 5%, indicating the statistical acceptance of the model.

The table further indicates the following:

- The statistical analysis reveals that the coefficient ($T = -2.19$) and the significance value ($Sig = 0.03$) indicate a significant negative relationship between human resources and the mitigation of negative practices of creative accounting in industrial companies listed on the ASE. Consequently, the alternative hypothesis, which states that there is a statistically significant effect at the significance level ($a < 0.05$) of the AIS (human resources) on mitigating negative practices of creative accounting in industrial companies listed on the ASE, is accepted, thereby rejecting the null hypothesis.
- The statistical analysis reveals that the coefficient ($T = -2.506$) and its corresponding significance value ($Sig = 0.013$) provide evidence of a significant negative relationship between physical resources and the mitigation of negative practices of creative accounting in industrial companies listed on the ASE. Consequently, the null hypothesis is rejected in favor of the alternative hypothesis, which asserts that there is a statistically significant effect, at a significance level of ($a < 0.05$), of the AIS (physical resources) on the mitigation of negative practices of creative accounting in industrial companies listed on the ASE.

- The statistical analysis reveals that the coefficient (T = 2.14) and the significance value (Sig = 0.033) indicate a significant positive impact of laws and legislation on reducing unfavorable practices of creative accounting in industrial companies listed on the ASE. Consequently, the null hypothesis is rejected in favor of the alternative hypothesis, which asserts that there is a statistically significant effect, at a significance level (a < 0.05), of the AIS (laws and legislation) in mitigating negative practices of creative accounting in industrial companies listed on the ASE.

4 Results

- The presence of a statistically significant association between human resources and physical resources and the reduction of negative practices of creative accounting in industrial companies listed on the ASE has been observed. This implies that an increased emphasis on the AIS, specifically through the allocation of human resources, leads to a decrease in the utilization of creative accounting techniques, such as earnings management.
- The impact of laws and legislation on curbing detrimental practices of creative accounting in industrial companies listed on the ASE is statistically significant. This finding suggests that when industrial companies prioritize their AIS by adhering to laws and legislation, the occurrence of creative accounting, specifically earnings management, diminishes.

4.1 Discussion of Results

There is now evidence that AIS introduction has proven effective in reducing unethical practice (creative accounting, which was rampant in ASE industrial firms). The discovery of benefits from AIS is now driving the trend of improving ethical accounting practices, preventing cases where unethical practices erode the credibility of data and having negative impacts on the reputation of the companies. Reliable support can be obtained: the system is amenable to auditors and reviewers who can perform scrutiny easily, as the rules are well defined for strict compliance with standards. The system preempts fraudulent practices through stiffer procedures while generating the information. In fact, compliance should be with guidelines, not knowing ways to adopt bending rules. It should not only be documented but published for all the stakeholders taking part in that process. AIS is shows its position in good management practices of industrial firms, which also serve indicative role for the level of investors' confidence (or negative, which the research in 2019 of Althebeh actually showed) in the financials of entity, which could be used as a signal to mitigate risk.

The findings from this study on research indicate how some of these human interactions within the AIS are a hindrance to creativity at the firm level-particularly to those firms within the ASE index. The likely cause for this negative impact could be a lack of skilled personnel in either the accounting or IT department, which limits their ability to adopt modern practices or innovation in accounting: thus if there is any deficiency of skillful manpower it would mean delays related to processing and analysis of accounting information—which would strangle any creative ideas within these organizations …from flowing easily towards challenges faced by their accounting systems. This finding is consistent with [16–18, 23] indicating that failure to comply with international accounting standards leads institutions into various frameworks on financial operations—thereby drowning fraud opportunities. Another finding from Zein and Hajazi's study in 2020 is that they identified creative accounting as a subset of manipulation and fraud. They underscored the value of external auditors' experience: it plays a key role in eliminating creative accounting practices. On a different note, pointed out that combating creative accounting is highly complex and challenging work [10, 14, 19, 20, 22]. This should serve as an impetus to stakeholders involved in this field to consistently work towards detecting and reducing these fraudulent practices [3, 21].

In the ASE, creative accounting practices are negatively affected by the presence of physical resources within AIS. This is due to large physical resources that need to be allocated for such systems—which in turn hampers companies' abilities to think innovatively because establishing and running those systems already takes a lot of effort. Instead of coming up with creative solutions that enhance performance or streamline processes, accountants find themselves stuck in mundane tasks like data entry or generating reports. Allocation of physical resources might draw attention away from any technological innovation at company level thereby acting as an impediment towards investment on new systems or technologies. Moreover, stifling creative accounting practices with potential new systems and technologies aid could be offered. This result agrees with a research undertaken by [12] showing that the use of creative accounting significantly affects the fairness and truthfulness of financial statements. In turn, it leads to more cases of fraud. One must use AIS prudently if they hope for attaining desired qualities of accounting information, among them include accuracy and clarity, as well as suitability and reliability along with timeliness [14, 19, 23].

4.2 Recommendations

The main outcomes of this research can provide a number of recommendations that could enhance the behavioral practices for industrial firms in the ASE, including:

- The research suggests that the development of investment in companies' human resources should be based on continuous training, ongoing development of personnel, and enhancement of approaches to selection and retention

of outstanding staff members. This will lessen the adverse effect from human resources on negative creative accounting.

- The research also suggests enhancing adherence to laws and regulations related to accounting, financial reporting and transparency within firms. It can result in enhanced behavioral practices. Such practices include curtailing negative creative accounting malpractices.
- It suggests bettering company's organizational culture by fostering transparency, accountability, and open communication among employees and management. Such a thing in turn could counteract negative creative accounting practices; leading improvement on behavioral practices.
- The study recommends improving reporting of violations and misconduct in companies, including improving reporting policies and whistleblower protection. This can lead to improved behavioral practices and a reduction in negative creative accounting practices.

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Attracting Consumer Attention by Exploring the Effects of Sales Promotion Tools: A Case Study on Carrefour Customers



Mustafa S. Al-Shaikh and Hadeel Mohammad Ahmad Shaza

Abstract The objective of this study is to investigate the influence of sales promotion tools, including free samples, coupons, discounts, and promotional competitions, on consumer attention. To accomplish this, a sample of 550 consumers from Carrefour (Amman) is randomly selected. A questionnaire is administered to the participants, and 490 completed questionnaires are included in the analysis. The descriptive analytical method is employed as it is deemed appropriate for the nature of the study, and statistical analyses are conducted using the SPSS program. The findings reveal a significant statistical impact of sales promotion tools in attracting consumer attention. Specifically, discounts are found to have the greatest effect, while coupons had the least effect. Based on the results, it is recommended that commercial centers, such as Carrefour, prioritize the use of sales promotion tools, particularly discounts, as they have a positive impact on attracting consumer attention and subsequently increasing sales.

Keywords Sales promotion tools · Attracting consumer attention · Jordan

1 Introduction

The current era of technological advancement, economic prosperity, and cultural growth has brought about a more complex market environment. In this context, commercial establishments like Carrefour are facing challenges in order to survive

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and thrive amidst fierce competition. As individuals' needs and desires become more diverse and their behavioral patterns undergo changes, production and market centers are compelled to adapt and promote their goods and services in order to attract customers, ensure satisfaction, and foster loyalty. As a result, more and more such centers are emerging, more and more products are being produced to provide customers with more options, greater efforts are being made to meet their needs, and greater accessibility is being made for cultural and economic consumers to compare. This has led to more competition between businesses to provide customers with more opportunities to compare stores. Moreover, consumer cultural and economic awareness has also led to the creation of more conscious and difficult to please customers. Conventional consumer behavior has lost its meaning, and people want multiple options so that their needs can be met at the best possible quality and/or price.

The sales promotion strategy has gained popularity as the preferred approach in many retail outlets. The strategy is aimed at persuading the customer to make a purchase immediately and attracting their attention after entering the premises. Fortunately, these stores have seen an increase in sales volume and expanded their market penetration. However, this change in corporate behavior, with the widespread use of sales promotion tools by marketers, has had an impact on consumers. This has now created price sensitivity and made consumers more willing to take advantage of good deals. Marketers have used more tools to deal with new consumer behaviors to retain existing customers and prevent the risk of losing customers to other competitors [1].

1.1 Research Problem and Questions

Currently, both shopping malls and commercial stores are struggling to attract the same customers, increase their market share, maintain a competitive advantage and bring benefits to their business. Moreover, the vast purchasing power of customers made it difficult to choose the heads and get a positive reaction from them. To address this issue, retail centers and stores have turned to the utilization of sales promotion tools as a means to attract consumer attention. However, determining the effectiveness of these sales promotion tools in capturing customers' attention poses a significant challenge for retail stores. Therefore, the main focus of this study is to investigate the impact of using sales promotion tools on attracting consumer attention. This main research question can be further broken down into the following sub-questions:

- What is the extent of the impact of free samples on attracting consumer attention?
- What is the extent of the impact of coupons on attracting consumer attention?
- What is the extent of the impact of discounts on attracting consumer attention?
- What is the extent of the impact of promotional competitions on attracting consumer attention?

1.2 Importance of the Study

The examination of sales promotion, one of the elements of the promotional mix, underscores the significance of this scientific study. It aims to elucidate the role of these tools in effectively capturing consumer attention and attracting customers, considering the intensified competition among commercial companies to garner a larger customer base. Furthermore, this study seeks to shed light on the concept of sales promotion. The practical value of this research lies in providing Carrefour and other commercial centers with valuable insights into the significance of employing sales promotion tools. Additionally, it contributes to the understanding of strategies for attracting customer attention and boosting sales.

1.3 Objectives of the Study

- To understand the impact of using sales promotion tools on attracting consumer attention.
- To identify the impact of using free samples on attracting consumer attention.
- To uncover the role of coupons in attracting consumer attention.
- To determine the extent of the impact of discounts on attracting consumer attention.
- To assess the impact of promotional competitions on attracting consumer attention at Carrefour (Amman).

1.4 Study Hypotheses

Main Hypothesis (H01): "There is no statistically significant impact of sales promotion tools on attracting consumer attention at the significance level ($\alpha \geq 0.05$)." From this hypothesis, the following sub-hypotheses are formulated:

- H01-1: "There is no statistically significant impact of free samples on attracting consumer attention at the significance level ($\alpha \geq 0.05$)."
- H01-2: "There is no statistically significant impact of coupons on attracting consumer attention at the significance level ($\alpha \geq 0.05$)."
- H01-3: "There is no statistically significant impact of discounts on attracting consumer attention at the significance level ($\alpha \geq 0.05$)."
- H01-4: "There is no statistically significant impact of promotional competitions on attracting consumer attention at the significance level ($\alpha \geq 0.05$)."

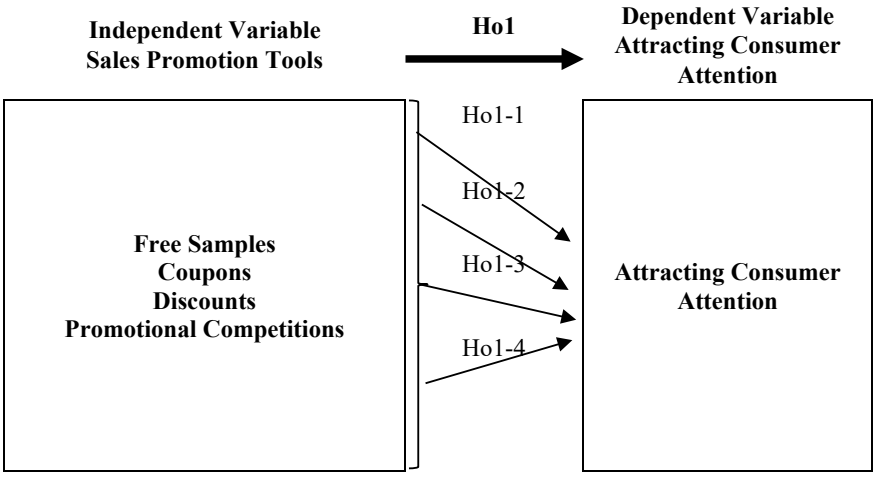


Fig. 1 Study model

1.5 Study Model

The study model was built based on [2–6] (Fig. 1).

1.6 Terminological Definitions

- **Consumer**: Individuals, whether they be natural or legal persons, engage in the act of purchasing goods and services from the market for personal use or on behalf of others. The purpose of these purchases is to fulfill their needs and desires, which are fulfilled through a variety of processes involving the acquisition of goods and services [7].
- **Sales Promotion**: Sales promotion refers to non-traditional approaches employed in the promotional process that are distinct from advertising, personal selling, and public relations. This category encompasses various incentive-based strategies that are specifically designed to yield immediate and short-term effects, with the goal of expediting the purchase of goods and services. Notable examples of sales promotion techniques include the provision of offers, free samples, coupons, and gifts, among others [8].
- **Attracting Attention**: The initial phase that guides consumers towards the process of making a purchase is known as attention. Attention refers to the mental state of concentrating and directing one's focus towards a particular subject, resulting in heightened awareness while disregarding other influences and stimuli that fail to reach conscious perception during this period of intense concentration and focus [9].

- **Free Samples**: Offering complimentary product samples to consumers is the most efficient method of introducing new products, despite the higher associated costs [10].
- **Coupons**: Vouchers that afford consumers discounted prices for a designated item are commonly referred to as certificates. These coupons can be delivered via mail, disseminated within the confines of a retail establishment, or featured in print advertisements found within newspapers or magazines [11].
- **Promotional competitions**: Contests that necessitate the sagacity and ingenuity of the contenders, with outcomes unaffected by chance, in order to acquire monetary rewards or tangible incentives through the acquisition of specific merchandise or active engagement in contest-related endeavors [12].
- **Discounts**: The packaging of the product may display a discounted price, which is a reduction from the original base price. This discount could be implemented by offering a single unit of the product at a lower price or by providing two units of different products at a price that is lower than their respective base prices [13].

2 Theoretical Framework

Promotional activity holds the distinction of being the most direct form of marketing that involves interaction with customers. It is through promotion that customers become aware of the existence of a product. The term "promotion" encompasses the process of popularizing a product, which necessitates effective communication and dissemination of information regarding the goods and services offered by the seller [14].

The primary objective of promotion is to capture the customer's attention, cultivate their interest, and facilitate their purchasing behavior by delivering relevant information. This promotional approach involves acquainting customers with new products and services, highlighting their distinctive features, and motivating them to make a purchase while also ensuring that the product remains top-of-mind through periodic reminders. Furthermore, promotion serves to shift the demand curve from one position to another [15]. Scholars have defined promotion as a collection of strategies employed to stimulate desire and interest, ultimately fostering customer engagement and facilitating the purchasing process through effective communication between the seller and the customer [13].

2.1 Previous Studies

According to a study [1], various sales promotion tools have been identified as effective in influencing consumer behavior. These tools include samples, discounts, buy one get one free offers, and in-store promotions. On the other hand, additional quantity and free gifts were found to have a moderate level of effectiveness. Coupons

and scratch and win promotions were identified as the least effective tools. Another study [4] conducted in Jordan found that sales promotion activities have a negative impact on consumer behavior, except for competition programs. This suggests that these activities may not be well-received by Jordanian consumers.

Furthermore, a study [16] confirmed the positive utilitarian effect of sales promotion programs on consumer behavior. These programs were found to play a significant role in influencing consumers' purchase decisions and contributing to increased sales for the institution. The study revealed that sales promotion activities have a strong influence of 93.8% on consumers' purchase decisions, with offers being the most responsive promotional tool. Moreover, one study [17] found that sales promotion techniques such as trade shows, promotional competitions, cost reduction and coupons strongly influence consumers' purchasing process, for example their initial thought about the product/service, subsequent thoughts, their opinion about product/service, their intention and likelihood to purchase. Finally, another study [18] shows that the key issue in relation to the consumer purchasing process is price reduction, which further emphasizes the importance of pricing policy in promotional and sales activities.

A study [19] shows that price cuts often affect Internet users. Similarly, another study [3] found that discounts are a tool that has a huge impact on improving consumer purchasing behavior and sales promotion is of great importance for retailers when creating their marketing plans. Sales promotions serve the excellent purpose of attracting a large number of customers to stores with the intention of making exceptional sales by offering incentives to encourage customers to purchase their products, which proves the enormous impact of sales promotion tools on repeat consumer behavior. Additionally, another study [2] found that discounts, samples, and free gifts are the most effective methods for generating a consumer response, while lotteries and games are less effective in eliciting purchasing behaviors. Furthermore, a study [20] revealed that promotions, instalment plans, and promotional competitions have the greatest influence on consumers' purchase decisions, highlighting the important role of sales promotions in shaping consumer behavior.

3 Methodology

3.1 Study Population and Sample

The target demographic for this study comprises individuals who are customers of the Carrefour retail chain located in Amman. Within the Kingdom, there are a total of 18 Carrefour stores, with 14 of them situated in Amman (as stated on the Carrefour website). These establishments attract a substantial number of consumers on a daily basis. The decision to focus on Carrefour customers in Amman as the study population was primarily driven by the fact that the majority of Carrefour branches are concentrated in this city. In order to ensure a scientifically sound representation of

the population, the researchers determined a minimum sample size of 384 customers, which was deemed sufficient to accurately reflect the study population [21].

4 Hypothesis Testing

- **Main Hypothesis (HO1)**: "There is no statistically significant impact of sales promotion tools on attracting consumer attention at the significance level ($\alpha \geq 0.05$)." Multiple linear regression tests were used to test the hypothesis, and Table 1 shows the results.

Based on the information provided in the table, it can be observed that the calculated value of F, which is (61.699), exceeds the critical value (2.42), indicating a statistically significant relationship between the independent and dependent variables. The significance level associated with F is (0.00), which is lower than the predetermined significance level of (0.05) for this study. Therefore, we can conclude that the null hypothesis is rejected, and the alternative hypothesis is accepted. This implies that there is indeed a statistically significant impact of sales promotion tools on attracting consumer attention, with a significance level of ($0.05 \geq \alpha$).

The value of R, which stands for the correlation coefficient, is 0.581, indicating a strong positive relationship between the dependent variable (consumer attention) and the combined independent variables (free samples, coupons, discounts, promotional competitions). This value exceeds the threshold of 0.5, further supporting the strength of the relationship. Additionally, the value of R2, which represents the coefficient of determination, is 0.337. This signifies that the combined independent variables account for approximately 33.7% of the variability observed in the dependent variable.

Therefore, the primary inquiry regarding the influence of employing sales promotion techniques in capturing consumer attention has been addressed. The provided table further indicates that the computed T value for coupons does not exhibit statistical significance at the designated significance level of 0.05, as evidenced by a value of 0.120. Conversely, the T values for the variables of free samples, discounts, and promotional competitions demonstrate statistical significance at the significance level of 0.05, with respective values of 0.00, 0.00, and 0.00, all of which are lower than 0.05.

4.1 Sub-Hypothesis 1

- H01-1: "There is no statistically significant effect of free samples on attracting consumer attention at the significance level ($0.05 \geq \alpha$)." To test Sub-Hypothesis 1, simple linear regression was used, and Table 2 illustrates the results of the simple linear regression for Sub-Hypothesis 1.

Table 1 Results of multiple linear regression test

Dependent variable	Correlation coefficient R	Determination coefficient R^2	Calculated F	Degrees of freedom	Significance level Sig	Independent variable	B Value	t Value	Significance level Sig
Attracting consumer attention				4		Free samples	0.213	4.260	0.000
	0.581	0.337	61.699	485	0.000	Coupons	0.061	1.556	0.120
				489		Discounts	0.215	4.623	0.000
						Promotional competitions	0.213	4.848	0.000

Table 2 Results of simple linear regression for sub-hypothesis 1

Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Independent variable	B value	Tabulated T value	Calculated T value	Significance level (Sig)
Attracting consumer attention	0.475	0.225	Free samples	0.485	1.96	11.917	0.000

The analysis of the data presented in the table reveals that the calculated T value (11.917) surpasses the tabular T value (1.96), thereby establishing a statistically significant relationship between the variables "attracting consumer attention" and "free samples". The significance level for the T value is recorded as 0.00, which is lower than the predetermined significance level of 0.05. Consequently, we reject the null hypothesis of the first sub-hypothesis and accept the alternative hypothesis, affirming that there is indeed a statistically significant effect of free samples on attracting consumer attention at a significance level of 0.05 or less. Moreover, a positive correlation is observed between attracting consumer attention and the variable "free samples", with a correlation coefficient of $R = 0.475$. The variable "free samples" accounts for 22.5% of the variation in the dependent variable, as indicated by the determination coefficient $R^2 = 0.225$ for both variables. Additionally, the value of $B = 0.485$ signifies the anticipated change in the dependent variable when the independent variable increases by one unit. Based on this value, it can be concluded that a one-unit increase in the variable "free samples" corresponds to a 0.485 increase in the dependent variable "attracting consumer attention".

4.2 Sub-Hypothesis 2

H01-2: "There is no statistically significant effect of coupons on attracting consumer attention at the significance level ($0.05 \geq \alpha$)." To prove the second sub-hypothesis, a simple linear regression test was used, and Table 3 illustrates the results of the simple linear regression for the second sub-hypothesis.

The results presented in the table demonstrate that the calculated T value (9.164) exceeds the tabulated T value (1.96), indicating a significant effect between the variables "attracting consumer attention" and "coupons". The T value has a significance

Table 3 Results of simple linear regression for sub-hypothesis 2

Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Independent variable	B value	Tabulated T value	Calculated T value	Significance level (Sig)
Attracting consumer attention	0.383	0.147	Coupons	0.323	1.96	9.164	0.000

level of (0.000), which is lower than the predetermined significance level of the study (0.05). Consequently, we reject the null hypothesis for the second sub-hypothesis and accept the alternative hypothesis: "There is a statistically significant effect of coupons on attracting consumer attention at the significance level ($0.05 \geq \alpha$)". A positive relationship exists between attracting consumer attention and the variable "coupons", as evidenced by a correlation coefficient of $R = 0.383$. The variable "coupons" accounts for 14.7% of the variability in the dependent variable, indicated by the determination coefficient $R^2 = 0.147$ for both variables. Moreover, the value of $B = 0.323$ signifies the anticipated change in the dependent variable when the independent variable experiences a one-unit change. In other words, a one-unit increase in the variable "coupons" corresponds to a 0.323 increase in the dependent variable "attracting consumer attention."

4.3 Sub-Hypothesis 3

H01-3: "There is no statistically significant effect of discounts on attracting consumer attention at the significance level ($0.05 \geq \alpha$)." To prove sub-hypothesis 3, simple linear regression was used, and Table 4 shows the results of the simple linear regression for sub-hypothesis 3.

The data presented in the table above demonstrates a statistically significant relationship between the variables "attracting consumer attention" and "discounts". This is evident from the calculated T value (12.099), which is greater than the tabulated T value (1.96). The significance level for the T value is (0.000), which is lower than the chosen significance level of the study (0.05). As a result, the null hypothesis for the third sub-hypothesis is rejected, and the alternative hypothesis is accepted: "There is a statistically significant effect of discounts on attracting consumer attention at the significance level ($0.05 \geq \alpha$)". Furthermore, there is a positive correlation between attracting consumer attention and the variable "discounts", as indicated by a correlation coefficient of $R = 0.480$. The variable "discounts" accounts for 23.1% of the variability in the dependent variable, represented by the determination coefficient $R^2 = 0.231$ for both variables. The value of $B = 0.470$ suggests that the dependent variable "attracting consumer attention" is expected to change by 0.470 units when the independent variable "discounts" changes by one unit. In other words, a one-unit

Table 4 Results of simple linear regression for sub-hypothesis 3

Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Independent variable	B value	Tabulated T value	Calculated T value	Significance level (Sig)
Attracting consumer attention	0.480	0.231	Discounts	0.470	1.96	12.099	0.000

increase in the variable "discounts" corresponds to a 0.470 increase in the dependent variable "attracting consumer attention."

4.4 Sub-Hypothesis 4

H01-4: "There is no statistically significant effect of promotional competitions on attracting consumer attention among Jordanian consumers at the significance level ($0.05 \geq \alpha$)." To prove sub-hypothesis 4, simple linear regression was used, and Table 5 shows the results of the simple linear regression for sub-hypothesis 4.

Based on the data presented in the table, it can be observed that the calculated T value (11.816) exceeds the tabulated T value (1.96), indicating a statistically significant relationship between the variables "attracting consumer attention" and "promotional competitions". The significance level for the T value is (0.000), which is lower than the predetermined significance level of the study (0.05). As a result, we can reject the null hypothesis for the fourth sub-hypothesis and accept the alternative hypothesis: "There is a statistically significant effect of promotional competitions on attracting consumer attention at a significance level of ($0.05 \geq \alpha$)".

A significant correlation exists between the variable "promotional competitions" and the ability to attract consumer attention, as evidenced by a correlation coefficient of $R = 0.472$. The variable "promotional competitions" accounts for 22.2% of the variability in the dependent variable, as indicated by the determination coefficient $R^2 = 0.222$ for both variables. Moreover, the coefficient value of $B = 0.450$ signifies the anticipated change in the dependent variable when the independent variable increases by one unit. Consequently, a one-unit increase in the variable "promotional competitions" corresponds to a 0.450 increase in the dependent variable "attracting consumer attention".

5 Discussion of Results

The most important findings of the study can be summarized as follows:

Table 5 Results of simple linear regression for sub-hypothesis 4

Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Independent variable	B value	Tabulated T value	Calculated T value	Significance level (Sig)
Attracting consumer attention	0.472	0.222	Promotional competitions	0.450	1.96	11.816	0.000

- The influence of sales promotion tools in capturing consumer attention has been observed. The findings of the study indicate that a majority of the participants acknowledged the effectiveness of free samples, coupons, discounts, and contests in attracting consumer attention. It was determined that sales promotion tools accounted for 33.7% of the factors contributing to consumer attention.
- Discounts have been identified as the most captivating sales promotion tool, as indicated by both the sample and the researcher. This is due to the considerable significance consumers place on price, leading them to be more drawn to activities that offer cost savings on products. The variable of discounts exhibited a substantial arithmetic mean of 4.16, signifying a statistically significant impact of discounts as a sales promotion tool in attracting consumer attention. Furthermore, discounts demonstrated the highest degree of explanatory power among the variables examined in the study, accounting for 23.1% of the observed effects.
- The research findings demonstrated that both the distribution of free samples and the organization of contests play a significant role in capturing the attention of consumers, as evidenced by an average score of 4.15 for each variable. This indicates the substantial influence that both tactics have on attracting consumer attention. It is common for consumers to actively seek out opportunities that offer added value or advantages to their purchases, which explains why sales promotion tools are frequently appealing to them.
- As a sales promotion strategy, coupons possess the capacity to captivate consumer interest towards products. The conducted study revealed that coupons indeed have an impact on attracting consumer attention, accounting for approximately 14.7% of the overall attention garnered. Nevertheless, it is worth noting that coupons exhibited the lowest explanatory capability among the variables examined in the study. From the standpoint of consumers, coupons are perceived as comparatively less effective than alternative sales promotion tools, suggesting that consumers place less emphasis on the specific type of coupon and instead prioritize its value.
- The findings of the study revealed that the provision of complimentary samples has a statistically significant effect on capturing the attention of consumers, accounting for 22.5% of the variance in consumer attention.
- Promotional competitions have been found exerting a statistically significant influence on the attraction of consumer attention, accounting for 22.2% of the variance in consumer attention towards products.

5.1 Recommendations

1. Exercising more fpcus on sales promotion tools in shopping centers of Carrefour due to their impact on attracting consumers' attention to products, which positively translates into sales growth.
2. It is imperative not to rely solely on the sales promotion tools mentioned in the study; rather, research and adopt other tools and methods that work to attract attention, such as additional quantities or installment options.

3. Increase the use of discounts, promotional competitions and free samples in shopping malls to attract consumers' attention.
4. Develop sales promotion tools, in particular coupons, to make them a stronger element of attracting consumers' attention and providing tangible benefits to consumers, as consumer interest is focused on savings.

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The Impact of Digital Marketing Techniques on Purchasing Decisions of Services: Telecommunications Customers as a Case Study



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Abstract The objective of this study is to examine how digital marketing techniques influence the purchasing decisions of services in Amman, Jordan. In order to achieve this objective, an inductive approach is utilized, combining descriptive and analytical methods. A questionnaire is developed based on relevant theoretical literature and previous studies pertaining to the topic of this study. The questionnaire is distributed electronically, resulting in a total of 409 responses. After excluding 17 responses from individuals who are not customers of Orange Telecom, 392 valid responses remained for analysis. The study population consists of all customers of Orange Telecom in Amman. The findings of the study indicate that digital marketing techniques, such as social media, email, text messages, and websites, have a statistically significant impact ($\alpha \leq 0.05$) on service purchasing decisions in Amman. Therefore, it is recommended that the company prioritize and allocate resources accordingly to each technique, focusing on utilizing the most effective ones. For instance, by emphasizing the company's website, service purchasing decisions can increase by 38%, followed by text messages, social media, and email.

Keywords Digital marketing · Social media · Email · Text messages · Website · Purchasing decision

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1 Introduction

The advent of technology and progress in our contemporary society has led to the extensive utilization of the internet and its various modern instruments, such as mobile devices, social media platforms, websites, and digital screens. Consequently, this has resulted in substantial transformations in the practices and conduct of both businesses and individuals. Furthermore, these advancements have exerted a significant influence on the modification of consumer buying habits. This has given rise to a virtual realm that offers novel opportunities for unorthodox marketing strategies for both sellers and buyers within the realm of the digital sphere [9].

The adoption of digital marketing strategies by organizations has been greatly influenced by the growing prevalence of the internet. This shift is primarily motivated by the fact that a significant portion of consumers now dedicate a substantial amount of time to online activities and heavily depend on the internet for product and service research and purchases [12]. As a result, incorporating digital techniques into marketing operations has become imperative.

The progressions in technology have given rise to contemporary and sophisticated domains of marketing, notably digital marketing. In the present era, digital marketing is widely regarded as the most crucial marketing tool owing to its expeditiousness, precision, rapid information retrieval, and direct interaction with customers. It assumes a pivotal role in executing marketing initiatives for organizations and enterprises at large, with a particular emphasis on telecommunication companies, as digital platforms have come to dominate the majority of services offered to their clientele [5].

When it comes to purchasing decisions, which serve as the crucial factor determining the success or failure of any organization, irrespective of its field of operation, it is imperative to acknowledge the growing range of services provided by organizations and the heightened consumer awareness regarding their wants and needs. However, it is equally important to recognize the challenges in comprehending consumers' purchasing decisions and their subsequent impact on future behavior.

1.1 Problem Statement and Research Questions

One of the key advantages offered by digital marketing methods is the convenience of reaching a vast consumer base at any time and from any location, with minimal exertion. Additionally, it grants consumers the ability to explore numerous online purchasing options and select the most suitable product from a wide array of choices, thereby prompting telecommunications companies to enhance their marketing approaches.

Although digital marketing techniques have been widely adopted by telecommunication companies in Jordan, there are still some companies that do not actively promote their services through these technologies. Moreover, some companies seem

to use such techniques only occasionally, without necessarily realizing that greater importance should be attached to their consequences. They do not provide adequate budgets or efforts for their promotional goals and may not have a holistic view of the most commonly used techniques. Our observation is that business owners may not be aware of the full potential of these technologies and all the benefits, returns and impact they can have in promoting their services and reaching potential consumers.

The advent of digital technologies and their integration with the internet has revolutionized the field of marketing, prompting an important inquiry: How do digital marketing techniques affect the decision-making process when it comes to purchasing services from Orange, a telecommunications company based in Amman, Jordan?

1.2 Study Objectives

The purpose of this research is to reveal the impact of implementing digital marketing strategies on potential behavior of Orange's, a telecommunication company, customers in Jordan. In pursuit of this main objective, a comprehensive set of sub-objectives has been formulated.

1.3 Study Hypotheses

The study hypotheses can be formulated as follows:

- **Main Hypothesis (HO)**: "There is no statistically significant impact ($\alpha \leq 0.05$) of digital marketing techniques, including social media, email, text messages, and website, on the purchasing decisions of services in Amman city."

This main hypothesis leads to the following sub-hypotheses:

- **Sub-Hypothesis 1 (HO1)**: "There is no statistically significant impact ($\alpha \leq 0.05$) of social media as one of the digital marketing techniques on the purchasing decisions of services in Amman city."
- **Sub-Hypothesis 2 (HO2)**: "There is no statistically significant impact ($\alpha \leq 0.05$) of email as one of the digital marketing techniques on the purchasing decisions of services in Amman city."
- **Sub-Hypothesis 3 (HO3)**: "There is no statistically significant impact ($\alpha \leq 0.05$) of text messages as one of the digital marketing techniques on the purchasing decisions of services in Amman city."
- **Sub-Hypothesis 4 (HO4)**: "There is no statistically significant impact ($\alpha \leq 0.05$) of the website as one of the digital marketing techniques on the purchasing decisions of services in Amman city."

These hypotheses will guide the study in exploring the relationship between digital marketing techniques and purchasing decisions in the context of Orange Telecom in Amman city.

2 Previous Studies

In a study conducted by Beshlawi et al. [5], significant findings were obtained. The research demonstrated that digital marketing, which includes various aspects such as website, social media, phone marketing, and email, exerts a favorable influence on consumers' purchasing decisions. However, the study also revealed that certain individual dimensions of digital marketing do not independently affect specific dimensions of the dependent variable, namely the purchasing decision.

In a similar vein, Batal's [4] research uncovered a cause-and-effect connection between online sales promotion strategies and consumers' purchasing choices. Likewise, identified a statistically significant influence of digital marketing and its various dimensions on the efficacy of customer communication. The study is concluded by recommending a comprehensive understanding of digital marketing requirements, as well as a focus on fostering innovation and creativity in marketing endeavors.

In a recent study conducted by, it was discovered that mobile phone advertisements garnered widespread acceptance and exerted a significant influence (with a level of significance set at 0.05) on the purchasing choices made by customers who engage with Mobilis. Similarly, Mouwaj [11] demonstrated a positive impact of social media platforms on the purchasing decisions of mobile phone users residing in the state of Jijel. The study further advised emphasizing the visual and auditory appeal of advertisements, as well as prioritizing the organization of information in a list format and establishing connections between their pages on various social media platforms.

3 Methodology and Procedures

3.1 Study Design

In this study, a descriptive methodology was employed, along with an inductive analytical approach. The descriptive method utilizes a range of statistical techniques associated with this approach, particularly measures of central tendency. The primary objective of the descriptive method is to provide clarity and description of data or phenomena by organizing, restricting, and presenting them in a clear manner through the use of tables and graphical representations ([2], p. 22). On the other hand, the inductive approach aims to analyze data in order to make reasonable predictions or inferences, understand the statistical significance, and provide a more comprehensive interpretation and description compared to the descriptive method. This approach

Table 1 Criteria for corresponding arithmetic mean levels

Arithmetic mean	(1–2.33)	(2.34–3.66)	(3.67–5.00)
Level	Low	Medium	High

strives to generate results that can be generalized to the entire statistical population based on the selected sample ([1], p. 20).

3.2 Study Population and Sample

The research encompassed the entire customer base of Orange Telecommunications Company located in Amman, Jordan. As stated in the company's 2023 report, the subscriber count reached an estimated 4.1 million by the conclusion of 2022. Additionally, the company had a presence in 61 different geographical locations within Amman, apart from their main headquarters. To obtain the study sample, an online questionnaire was created and distributed using the snowball sampling technique. This method involves selecting certain individuals to participate in the study and then requesting them to identify other interested individuals who can also contribute by completing the survey. Snowball sampling is employed when it is challenging to directly access individuals from the target population ([13], p. 351).

Following a waiting period of four weeks, a total of 409 questionnaires were received electronically. Subsequent screening resulted in the exclusion of 17 questionnaires, as the respondents did not meet the criteria of being subscribers or customers of Orange. As a result, the final number of questionnaires included in the analysis amounted to 392. This sample size surpasses the minimum requirement for a statistically representative population, as indicated by the sampling table developed by Sekaran and Bougie ([15], p. 375), ensuring coverage of any indeterminate population.

From Table 1, it is evident that if the mean falls below (2.33), the level can be judged as low. If the mean ranges between (2.34–3.66), it is within the moderate level. If the mean exceeds (3.67), it is considered of high importance.

3.3 Validity and Reliability of the Study Tool

- **Face Validity**

To ensure content validity, the questionnaire was initially presented to a panel of 8 experts, consisting of academics and other knowledgeable individuals, who were tasked with reading, evaluating, and reviewing the questionnaire. Following their thorough review of the questionnaire's items and phrases, several suggestions were

offered, and necessary adjustments were made to enhance the readiness of the final version.

- **Construct Validity**

To assess the validity of the study instrument and effectively accomplish its desired goals, the relationship between the phrase and its corresponding domain, which represents the dimension being measured, will be determined and quantified using Pearson's coefficient. As explained by Patten and Newhart ([14], p.126), when calculating the correlation between the phrase and its domain, it is important to note that the phrase should not exhibit a negative sign (−), and the correlation coefficient should exceed 0.25. If these conditions are not met, it is advisable to exclude the phrase from further analysis. The outcomes of the construct validity assessment of the scale items are presented in Table 2.

According to the scale items in Table 2, it can be clearly seen that the correlation coefficient of the scale was greater than the cut-off point of 25%, that is, it had a significant positive relationship. The scale items that are related to each other have a value between 0.600 and 0.827.

3.4 Reliability of the Study Tool

Reliability measurement is an important assessment used in determining the reliability of a scale or tool used in a research study. By using reliability, it ensures that the results obtained from administering the scale to the same participants on different occasions are consistent. Additionally, the alpha coefficient of the Cronbach scale was used to assess the reliability of the research tool, where a value greater than 70% indicates the reliability of the research tool, and the closer the value is to 100%, the higher the degree of reliability ([15], p. 322).

Table 3 shows that the reliability and stability of the scale are reflected in the data, as the overall Cronbach's Alpha coefficient reached an acceptable value of 0.929 and its dimensions (0.782–0.892) reached acceptable values. These findings confirm the reliability and stability of the scale, as coefficients exceeding 70% were obtained.

3.5 Normal Distribution Test

In order to determine whether the data collected from customers of Orange Jordan Telecommunications Company adheres to a normal distribution, the researchers conducted Kurtosis and Skewness tests. It is important to note that a Skewness value below ± 1 indicates that the data is normally distributed. Similarly, a Kurtosis value below ± 1.96 is considered indicative of a normal distribution ([8], p. 70). The findings of the normal distribution test for the variables and dimensions of the study's respondents can be found in Table 4.

Table 2 Mean correlation of scale items with their domain

Technique	Phrase	Correlation
Digital marketing techniques		
Social media marketing	1	0.653
	2	0.689
	3	0.686
	4	0.683
	5	0.760
	6	0.685
Email marketing		
Email marketing	7	0.668
	8	0.669
	9	0.688
	10	0.633
	11	0.688
	12	0.659
	13	0.651
	14	0.689
	15	0.600
SMS marketing		
SMS marketing	16	0.656
	17	0.780
	18	0.827
	19	0.806
	20	0.760
Website technique		
Website technique	21	0.707
	22	0.686
	23	0.740
	24	0.736
	25	0.761
	26	0.739
	27	0.738
Service purchase decision		
Service purchase decision	28	0.601
	29	0.647
	30	0.735
	31	0.724
	32	0.695
	33	0.659

(continued)

Table 2 (continued)

Technique	Phrase	Correlation
	34	0.671
	35	0.685

Table 3 Cronbach's Alpha results

Statement	Social media technology	Email technology	SMS technology	Website technology	Digital marketing technologies
Number of items	6	9	5	7	27
Cronbach's Alpha	0.782	0.838	0.822	0.854	0.892

Statement	Service purchase decision
Number of items	8
Cronbach's Alpha	0.830
Overall indicator for all items	0.929

Table 4 The results of the normal distribution test

Variable/Dimension	Test	Independent
Social media technique	Skewness	0.692
	Kurtosis	1.689
Email technique	Skewness	0.607
	Kurtosis	0.925
Text messaging technique	Skewness	0.666
	Kurtosis	1.239
Website technique	Skewness	0.512
	Kurtosis	1.270
Digital marketing techniques	Skewness	0.612
	Kurtosis	1.650
Service purchase decision	Skewness	0.463
	Kurtosis	0.792

The data that has been gathered exhibits a normal distribution, as can be observed from the findings presented in Table 4, wherein the skewness and kurtosis values lie within the range of $\pm$ 1 and $\pm$ 1.96, correspondingly.

The suitability of the study model for the statistical methods employed must be considered when investigating the impact of multiple independent variables on a dependent variable. It is imperative to avoid significant correlations between these variables, as such correlations can undermine the predictive power of the study model and obscure the true contribution of each independent variable in explaining

the dependent variable. Consequently, the regression coefficients lose their independence and become unreliable. Ideally, in multiple regression analysis, the correlations between independent and dependent variables should be strong, while the correlations among independent variables should be weak ([3], p. 17). In our study, we have identified four independent variables: Social Media Technique, Email Technique, Text Messaging Technique, and Website Technique. It is crucial to examine these variables and ensure that there are no substantial correlations among them. This can be accomplished by analyzing the Pearson correlation matrix, whereby a correlation coefficient below 0.80 indicates the absence of multicollinearity ([7], p. 365).

Upon conducting calculations to determine the correlation coefficient between various digital marketing techniques, as presented in Table 5, it becomes apparent that the highest value of the correlation coefficient obtained is 0.576. This correlation is also seen between text messaging technique and web development technique which is below 0.80. From this finding, we can conclude that there is no significant correlation between the three different types of digital marketing techniques analyzed because there is no type of linear duplication between them.

The VIF test is a good measure to detect whether there is multicollinearity between the digital marketing techniques we used in the study: social media technique, email technique, text messaging technique, and website technique. If the inflation factor is less than five, it means that there is no significant consistency or linear repetition of digital techniques. Tolerance can be a good indicator and can be obtained by dividing it by the inflation factor. For this reason, if the tolerance of digital marketing techniques is greater than 0.2 and less than one, then we find out that digital marketing techniques do not repeat linearly ([8], p. 201).

Looking at Table 6, we can conclude that there is nothing to worry about, that is, multicollinearity, which is confirmed by the VIF value being lower than (5), and also because the tolerance values are higher than the threshold values—(0.2) and not exceeding (1).

Table 5 Pearson correlation matrix between digital marketing techniques

Digital marketing techniques	Social media technique	Email technique	Text messaging technique	Website technique
Social media technique	1			
Email technique	0.456	1		
Text messaging technique	0.466	0.502	1	
Website technique	0.478	0.449	0.576	1

Table 6 Results of variance inflation factor and tolerance test

Digital marketing techniques	Social media technique	Email technique	Text messaging technique	Website technique
Variance inflation factor (VIF)	1.480	1.496	1.742	1.675
Allowed variance (1/VIF)	0.676	0.669	0.574	0.597

3.6 The Statistical Methods Used in the Study

The research questions and objectives were analyzed and implemented to achieve the purpose of the study and evaluate its model. For this purpose, the SPSS "Statistical Package for the Social Sciences" was used, which helped in conducting several descriptive inferential tests related to the study.

3.7 Testing the Study Hypotheses

Following a thorough assessment of the appropriateness of the statistical techniques employed, this section presents the outcomes of the statistical analysis conducted to test the study hypotheses. Subsequent to the analysis, the null hypothesis (HO) is either accepted or rejected.

3.8 Results of the Main Hypothesis Test

- HO: "There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for digital marketing techniques, represented by (social media, email, text messaging, website), on the purchasing decision of services in Amman city."

This hypothesis was tested using multiple linear regression, and the results are as shown in Table 7.

The findings of the multiple regression analysis, as presented in Table 7, demonstrate a robust association between digital marketing strategies and the decision to purchase services, as manifested by the correlation coefficient value (R = 68.3%). It can be observed that digital marketing techniques explain 46.6% of the variability in the decision to purchase services, as indicated by the coefficient of determination (R2).

The findings derived from Tables 4, 5, 6, and 7 indicate a substantial influence of digital marketing strategies on the decision-making process for service purchases, as per the decision rules. This conclusion is further supported by the probability value

Table 7 Results of testing the impact of digital marketing techniques on the purchasing decision of services

Dependent variable	Digital marketing techniques	Standard deviation coefficients		Standard coefficients	(T) calculated	T.Sig.
		Standardized	Standard error	Beta coefficient β		
Purchasing decision for services	Constant	1.021	0.171		5.986	0.00
	Social media	0.136	0.044	0.139	3.067	0.002*
	Email	0.115	0.041	0.128	2.808	0.005*
	Text messaging	0.169	0.042	0.197	4.016	0.00*
	Website	0.352	0.045	0.380	7.908	0.00*
R	R^2	Adj R^2		F calculated		F.Sig.
0.683	0.466	0.460		84.403		0.00*
Significant at ($0.05 \geq \alpha$) level						
Tabulated F value = 2.21			DF = 4/38		Tabulated T value = (1.960)	

(F.Sig = 0.00), which is lower than the predetermined significance level (0.05). Moreover, the computed F value (F = 84.403) surpasses the critical F value corresponding to 4/387 degrees of freedom.

Upon examination of the standardized coefficients in the primary hypothesis table, it is evident that social media marketing yielded a positive impact (β = 0.139) on the dependent variable, namely the purchasing decision for services, with a t-value of 3.067, surpassing the critical threshold at a significance level of 0.05. Likewise, email marketing (β = 0.128), text messaging (β = 0.197), and website marketing (β = 0.380) also exhibited favorable effects on the purchasing decision, as indicated by their respective t-values surpassing the critical threshold at a significance level of 0.05.

Consistent with the prescribed decision rules, we proceed to reject the null hypothesis (HO) and embrace the alternative hypothesis (Ha), which posits that digital marketing techniques, encompassing social media, email, text messaging, and website marketing, have a statistically significant impact, at a significance level of ($\alpha \leq 0.05$), on the consumer's decision to purchase services within the confines of Amman city.

4 Discussion of Results and Recommendations

4.1 Discussion of Results

The study yielded the following results:

- Discussion of the results related to the main question (H0): What is the influence of digital marketing techniques on the decision to purchase Internet services at Orange Jordan Telecommunications Company in Amman?

The findings of this study demonstrate a statistically significant impact, with a significance level of ($\alpha \leq 0.05$), of digital marketing strategies, encompassing social media, email, text messaging, and website marketing, on the decision-making process for service purchases in the city of Amman. These results align with prior research conducted by, which also established the influence of different facets of digital marketing tool utilization on the purchasing behavior of students attending private universities in Amman.

- The discussion of the results concerned the first sub-question: What influence do social media have on the decision to purchase Internet services at Orange Jordan Telecommunications Company in Amman?

The findings of this study indicate a statistically significant impact of social media marketing on the purchasing decision for services in Amman, with a significance level of ($\alpha \leq 0.05$). These results align with prior research conducted by Mouwaj [11], which also demonstrated a significant positive association between positive advertising on social networks and the perception of service value.

- The discussion of the results concerned the second sub-question: What impact does e-mail marketing have on the decision to purchase Internet services at Orange Jordan Telecommunications Company in Amman?

The research results show that e-mail marketing has a significant impact on the decision to purchase a service in Amman with a significant level less than or equal to 0.05.

This is consistent with the results of a study conducted by Lajdell and Ben Jameel [10], which showed a significant impact of email marketing on the purchase decision.

- Results of the third sub-question: What is the impact of SMS on the purchase of Internet services at Orange Jordan Telecommunications Company in Amman?

The study results indicate a significant statistical impact on customers' decision-making process regarding the use of digital marketing via text messaging to purchase services in Amman city with a significance level of ($\alpha \leq 0.05$). These results align with the research conducted by Eishawi [6], which also identified a statistically significant influence of mobile marketing on consumer purchasing decisions.

- Discussion of the results related to the fourth sub-question: What influence does the website have on the decision to purchase Internet services at Orange Jordan Telecommunications Company in Amman?

The findings of this study indicate a statistically significant impact of the website as a digital marketing strategy on the decision-making process for services in Amman, with a significance level of ($\alpha \leq 0.05$). These results align with previous research conducted by, who emphasized the efficacy of websites in achieving diverse aspects of digital marketing for organizations in Egypt.

4.2 Recommendations

In light of the study results, the researchers recommend the following:

1. Marketers should focus on leveraging digital marketing techniques due to their significant impact on purchasing decisions in Amman. This can be achieved by examining the impact of each technique mentioned (social media, email, text messaging, internet marketing) on purchasing decisions.
2. For Orange Jordan Telecommunications Company, it is important to improve the quality of interactions via social media platforms. Given their strong influence on purchasing decisions, the company can offer new and innovative services through these platforms.
3. Offering limited free trials of Internet services provided by Orange Jordan Telecommunications Company via email may increase demand. This strategy allows potential customers to experience services firsthand, leading to potential conversions.
4. There should be awareness campaigns highlighting the benefits of SMS messaging offered by Orange Jordan Telecommunications Company. Thanks to the ease and speed of delivery, SMS messages can effectively communicate a company's services to customers.

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The Determinants of Banks' Efficiency: A Comparative Study of Islamic and Conventional Banks Using Data Envelopment Analysis



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Abstract Efficiency stands as a cornerstone for banks to foster economic growth and ensure financial stability within a nation. This study delves into the evaluation and comparison of technical efficiency between Islamic and conventional banks across Iran, Jordan, Palestine, Lebanon, and Syria. Employing the Data Envelopment Analysis (DEA) model, we assess the performance of eighty-three banks, considering inputs such as assets, capital, and deposits, alongside outputs including income, investment, and advances. Additionally, regression analysis is utilized to identify key factors influencing bank efficiency, encompassing bank size, liquidity, profitability, capital ratio, non-performing loans, gross domestic products (GDP), rule of law, and the bank's Islamic or conventional nature. Our findings unveil that Islamic banks, on the whole, surpass their conventional counterparts. Particularly, Islamic banks in Iran, Jordan, and Palestine exhibit superior efficiency, while conventional banks in Syria and Lebanon demonstrate greater efficacy. Regression analysis underscores the positive impact of return on assets, non-performing loans, capital adequacy, liquidity, and GDP on bank efficiency, whereas the rule of law exerts a negative influence. To bolster efficiency, regulatory bodies should contemplate establishing efficiency benchmarks for banks. Moreover, future research avenues should explore alternative efficiency measurement methodologies to deepen our understanding and enhance banking efficiency. This study contributes to the existing literature by furnishing empirical evidence on the determinants of bank efficiency in the Middle East region.

Keywords Data envelopment analysis · Technical efficiency · Constant return to scale · Variable return to scale · Islamic banks

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1 Introduction

The banking industry's rapid expansion has drawn increased attention from stakeholders, who seek to evaluate banks' performance through key financial metrics such as productivity and efficiency [1, 2]. Efficiency plays a pivotal role in both Islamic and conventional banks, influencing their overall success and financial stability. Efficient banks possess the ability to generate profits, maintain a robust capital base, and navigate through market risks, financial challenges, and economic uncertainties [3, 4]. Efficiency is fundamental benchmark for assessing bank performance, representing the ratio of outputs to inputs. The goal is to maximize output relative to inputs or to minimize inputs relative to outputs, with highly efficient banks demonstrating superior productivity, thus enhancing their financial performance and competitive edge [5–7].

The Middle East, strategically positioned between Europe and Asia and endowed with vast oil reserves, has witnessed rapid growth in its banking systems. However, the presence of political instability and weak institutional foundations have limited their potential, necessitating proactive economic and institutional policies, especially in the realm of Islamic finance, to fully harness the region's banking capabilities. Middle Eastern banks confront systemic risks [8] such as price shocks and inflation, since they are operating within challenging economic and political landscapes [7, 9, 10], demanding vigilant credit management strategies. Additionally, the proliferation of domestic and international commercial banks intensifies competition for Islamic banks [2], prompting them to adopt internal revenue generation strategies to ensure sustainability.

Against this backdrop, studying the efficiency of conventional and Islamic banks in Middle Eastern countries becomes imperative, guiding these institutions towards corrective measures and underscoring the importance of banking efficiency. This study aims to address two key questions:

1. How are the efficiency levels of Islamic banks compared to conventional banks in the selected countries, as evaluated by the DEA?
2. What are the determinants of bank efficiency in these countries?

Efficiency in banking is crucial for cost reduction, leading to improved profitability and competitiveness. Given the lack of prior research evaluating bank efficiency in these specific countries, this study employs DEA and regression analysis to assess technical efficiency. Notably, previous studies suggest that Islamic banks in the Middle East may be more vulnerable to competition-induced fragility compared to their conventional counterparts, highlighting the policy implications for bank stability [1, 3, 5, 11].

This study holds significance for various stakeholders, including investors, customers, regulators, and central banks, by providing insights to enhance decision-making and monitoring in the banking sector. By enhancing performance, fostering competition, and understanding performance variations across different conditions, this research contributes to a comprehensive understanding of bank efficiency in the Middle East.

2 Bank Efficiency Using DEA

DEA serves as a powerful tool for evaluating bank efficiency, allowing for comparisons between a bank's technical efficiency and that of others operating under similar conditions. It operates as a non-parametric method grounded in linear programming theory, enabling the assessment of relative efficiency among decision-making units (DMUs) [1, 11]. These DMUs utilize inputs to generate outputs, and their efficiency is measured relative to other units within the sample [12]. DEA aids in identifying best practices by benchmarking unit performances against each other.

DEA encompasses several models, with the Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) models being the most notable. The CRS model assumes that inputs lead to constant returns, indicating that banks produce consistent outputs using the same inputs [13]. Conversely, the VRS model recognizes heterogeneous changes in both inputs and outputs among banks, offering a more flexible assessment of efficiency [14]. While VRS is considered more realistic, it requires more detailed data processing.

DEA employs two primary efficiency measurement models: input-oriented and output-oriented. The input-oriented model aims to minimize inputs, assuming that the most efficient bank utilizes the fewest resources to produce the same outputs [15]. Conversely, the output-oriented model seeks to maximize output with the same level of resources, considering the most efficient bank achieves the highest output with the same input level [15, 16].

3 Hypotheses Development About the Determinants of Bank Efficiency

Banks exhibit varying characteristics that distinguish their internal environments and performance within the sector. Key factors such as capital ratio, size, liquidity, GDP, profitability, non-performing loans (NPL), rule of law, and bank type are pivotal in defining a bank's efficiency.

1. Non-Performing Loans (NPL)

Non-performing loans, relative to total loans and advances, indicate loans at risk or in default, necessitating significant capital allocation for risk management. Elevated levels of non-performing loans diminish bank efficiency, escalating credit risk and operating expenses. Banks typically mitigate this risk through asset restructuring and distressed asset sales [17].

H1: There exists a negative correlation between non-performing loans and technical efficiency.

2. Bank Size

Bank size, often quantified by total assets, profoundly impacts bank efficiency. Larger banks often benefit from economies of scale, resulting in cost efficiencies and

improved service provision. Conversely, smaller banks may display enhanced flexibility in adapting services, rendering them more resilient during economic downturns [17, 18].

H2: A positive relationship is observed between bank size and technical efficiency.

3. Profitability

Profitability, gauged by return on assets (ROA), serves as a fundamental indicator of a bank's efficiency. The bank's capability to generate profits and uphold profit margins underscores effective expense management, risk distribution, and investment competence. However, an excessive focus on profitability may elevate risks and administrative costs, thereby dampening bank efficiency [17].

H3: A positive correlation exists between profitability and bank efficiency.

4. Liquidity

Liquidity, assessed via the ratio of total equity to total assets, signifies a bank's capacity to meet short-term obligations without incurring substantial losses. Banks boasting high liquidity are perceived as more stable and appealing to clients, while low liquidity amplifies operational inefficiencies and risk exposure [19].

H4: A positive association is evident between liquidity and technical efficiency.

5. Capital Adequacy

The capital ratio, ascertained by total equity to total assets, plays a pivotal role in bolstering financial stability and efficiency. Adequate capital empowers banks to withstand losses effectively and allure customers seeking secure banking options. Nevertheless, an excess of capital may inflate administrative costs and risks [17, 19].

H5: A positive correlation is observed between bank capital and technical efficiency.

6. GDP Growth

GDP growth exerts influence on bank efficiency by stimulating consumer demand for financial services. A stable economy fosters profitability and competition among banks, thereby enhancing efficiency. However, economic expansion may precipitate inflation and financial instability, potentially undermining bank efficiency [17, 19].

H6: A positive relationship is anticipated between GDP growth and technical efficiency.

7. Rule of Law

The rule of law, safeguarding banking system integrity and stakeholder interests, positively impacts bank efficiency by fostering competition and transparency. Nonetheless, robust legal frameworks may escalate administrative costs, thereby affecting bank profitability and efficiency [17].

H7: A positive correlation is expected between the rule of law and technical efficiency.

8. Bank Type

Both Islamic and conventional banks prioritize efficiency to ensure stability, confront risks, and attract clientele. Enhanced bank efficiency bolsters stability and profitability, rendering banks more resilient to economic and political fluctuations [1, 3, 15, 16].

H8: A positive relationship is predicted between Islamic bank status and technical efficiency.

4 Research Methodology

4.1 Data

This study compares the efficiency of Islamic banks with traditional banks across the aforementioned countries. The sample comprises 83 banks, including 27 Islamic banks and 56 traditional banks. Some banks were excluded due to insufficient data covering the entire study period. The research adopts a quantitative study design utilizing secondary data extracted from annual financial reports. To mitigate the impact of the global financial crisis of 2008 and the COVID-19 pandemic of 2019, we have chosen the period between 2013 and 2017.

4.2 Data Analysis Approach

First stage: Data Envelopment Analysis (DEA). The DEA technique is vital for evaluating banks' efficiency by comparing inputs and outputs. It helps identify best practices and areas for improvement. In this study DEA has assessed both Islamic and traditional banks' efficiency using input-oriented approach. Inputs in this study include assets, deposits, and capital, while outputs consist of advances, investments, and income as presented in Table 1.

Mathematical explanation. The CRS model can be represented mathematically using an efficiency estimation equation using data envelopment analysis as in Model 1 below:

$$Minimize\ \emptyset_k \tag{1}$$

Subject to

$$y_{rk} - \sum_{j=1}^{n} \lambda_j y_{rj} \leq 0 \quad r = 1, \ldots, s$$

Table 1 Measurements of inputs and outputs for DEA analysis

Variables	Description	Reference
Inputs		
Deposits	Total deposits of client	Abdeljawad et al. [20], Kerimov et al. [21], Hassan and Aliyu [22], Sillah and Harrathi [23]
Assets	Total assets of the bank	Kerimov et al. [21], Hassan and Aliyu [22], Sillah and Harrathi [23]
Capital	Total equity capital	Hassan and Aliyu [22], Abdeljawad et al. [20]
Output		
Investment	Total investments granted	Hassan and Aliyu [22], Sillah and Harrathi [23], Hassan et al. [24]
Advances	Financing and other related assets	Hassan et al. [24]
Income	Total bank revenues after subtracting the costs of doing business such as depreciation, interest, taxes and other expenses	Hassan and Aliyu [22], Abdeljawad et al. [20]

$$\emptyset_k x_{ik} - \sum_{j=1}^{n} \lambda_j x_{ij} \geq 0 \quad i = 1, \ldots, m$$

$$\lambda_j \geq 0 \quad \forall j = 1, \ldots, n$$

Minimize $\emptyset_k$: The minimum degree of efficiency of the DMU and k is the total number of units to be measured.

x_{ik}: The number of inputs to the DMUs to be measured
y_{rk}: The number of outputs of the DMUs to be measured
M: is the total number of input variables (in this study, 3 inputs)
S: is the total number of output variables (in this study, 3 outputs)
N: The number of units to be measured (in this study, 83 banks)
λ_j: The inputs and outputs to be measured must be positive.

Second stage: **Regression analysis**. The second objective of this study involves employing regression analysis to address the primary factors influencing bank efficiency. The dependent variable in this analysis represents bank efficiency, measured through various indicators utilized to capture different dimensions of bank efficiency. Table 2 presents the measurement of dependent variables and independent variables in this study. Model 2 next was estimated using pooled panel data with robust standard errors to account for heteroscedasticity and autocorrelation.

$$\begin{aligned} Y_{it} = {} & B0 + B1 * SIZE_{itm} + B2 * PROF_{itm} + B3 * LIQ_{itm} \\ & + B4 * CAR_{itm} + B5 * NPL_{itm} + B6 * Islamic_{itm} \end{aligned}$$

Table 2 Dependent and independent variables measurement

Variable	Definition	References
Dependent variables		
IO CRS	Input oriented technical efficiency with constant return to scale. Calculated from the first stage	Kamarudin et al. [19]
IO VRS	Input oriented technical efficiency with variable return to scale. Calculated from the first stage	Kamarudin et al. [19]
Independent variables		
NPL	Non-performing loans to gross loans and advances granted to customers	Al-Sharkas and Al-Sharkas [25]
SIZE	Natural logarithm of total asset	Al-Sharkas and Al-Sharkas [25]
PROF	Return on assets is the net profit after tax to total assets	Abdeljawadet al. [17]
LIQ	Total loans divided by total deposits	Saleem et al. [26]
CAR	A ratio of the total equity to total asset	Abdeljawadet al. [17]
GDP growth	Measured as the percentage change in real gross domestic products obtained from world bank national accounts data	Antunes et al. [27]
Rule of law	The "Rule of law" concept reflects society's confidence in and adherence to rules, encompassing aspects like contract enforcement, property rights, law enforcement, judiciary quality, and crime likelihood. Obtained from worldwide governance indicator of world bank	Kamarudin et al. [19]
Islamic	Measured as dummy variable, where '1' is used for Islamic, while '0' is used for conventional	Abdeljawadet al. [17]

$$+ \mathrm{B7} * \mathrm{GDP}_{\mathrm{tm}} + \mathrm{B8} * \text{Rule of Law}_{\mathrm{tm}} + \mathrm{e} \tag{2}$$

Y is the technical efficiency,
B0-B8 are the regression coefficients, and
e is the error term. i subscript is used for bank, t for year, and m for country.

5 Results and Discussions

5.1 Results for the First Stage: Efficiency Estimation Using DEA

DEA results with input orientation focus on minimizing inputs. The closer the score is to 1, the more efficient the DMU is. CRS assume proportional scaling of inputs and outputs, while VRS allow for deviations from this proportionality. Efficiency

Table 3 Summary for results of average technical efficiency score

Type	Country	Input-CRS	Input-VRS
Conventional banks	Iran	0.430	0.477
	Jordan	0.597	0.663
	Lebanon	0.466	0.534
	Palestine	0.593	0.631
	Syria	0.602	0.732
Average		0.537	0.613
Islamic banks	Iran	0.740	0.832
	Jordan	0.874	0.926
	Lebanon	0.256	0.761
	Palestine	0.612	0.655
	Syria	0.577	0.666
Average		0.591	0.802

scores in DEA indicate how effectively a DMU is utilizing its resources to achieve its objectives relative to other units being evaluated. Table 3 presents the results of country average DEA for both conventional banks and Islamic banks.

In Iran, Jordan, and Palestine Islamic banks showed superior average technical efficiency. However, in Lebanon and Syria conventional banks displayed better average technical efficiency. Overall, Islamic banks are, on average, more efficient.

5.2 Results for the Second Stage: Regression Analysis

Descriptive statistics. Descriptive statistics were computed for a sample consisting of 415 observations spanning the period from 2013 to 2017 across 83 banks. However, the number of observations for some variables was 323 due to missing data for certain variables in certain years. These descriptive statistics provide insights into the central tendency, variability, and range of the data, helping to identify any outliers or trends within the dataset.

Table 4 presents descriptive statistics for the dependent variables representing the efficiency of all banks across the selected regions. These variables include the input-oriented technical efficiency models with both CRS and VRS. The table indicates that the average efficiency ratios for the banks within the sample are 0.591 for CRS and 0.675 for VRS. This suggests that banks are generally able to utilize their inputs to produce outputs efficiently, but there is room for enhancement. However, there is considerable variation within the sample, with some banks exhibiting low technical efficiency and others demonstrating high technical efficiency, as indicated by the standard deviations of 0.203 for CRS and 0.212 for VRS.

Table 4 Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
CRS	415	0.591	0.203	0.002	1
VRS	415	0.675	0.212	0.005	1
Bank size	415	21.581	1.656	17.672	24.804
ROA	415	0.013	0.041	− 0.325	0.287
Capital ratio	415	0.127	0.118	− 0.633	0.792
Liquidity	323	0.235	0.106	0.011	0.499
GDP growth	323	− 0.004	0.069	− 0.263	0.089
Rule of low	323	− 0.676	0.722	− 2.096	0.467
NPL	323	0.151	0.199	0	1.296
Islamic	415	0.325	–	0	1

Furthermore, the table includes descriptive statistics for factors influencing bank efficiency, such as bank size, return on assets, capital ratio, liquidity, GDP growth, rule of law, and non-performing loans. These statistics reveal averages, minimums, and maximums for each factor, highlighting the range of values observed within the sample. Negative values for GDP growth and the rule of law indicate instances of economic recession and weak legal frameworks, respectively. Additionally, the table presents statistics for the dummy variable indicating Islamic banks, with an average of 32.5 percent of the sample consisting of Islamic banks.

Pairwise correlations. Table 5 displays the pairwise correlation between variables. It reveals a strong correlation of 0.881 between VRS and CRS, adding to the validity of the dependent variable's measurement. To address the multicollinearity issue, we need to examine the correlation between the independent variables (size, profitability, capital, liquidity, GDP, rule of law, and non-performing loans), which is less than 0.80 in absolute value [28]. Therefore, we can conclude that there is no multicollinearity problem among the independent variables.

Estimation Results. The estimation yielded R-squared values of 0.644 and 0.474, indicating the extent to which the independent variables can explain the dependent variable. The model is estimated using pooled panel data, and all standard errors are robust. The relationship between the size of the bank and efficiency is not significant. This implies that larger banks do not exhibit different efficiency than smaller ones. As for profitability, the analysis revealed a positive, statistically significant relationship with both models. This suggests that banks with higher profitability tend to utilize inputs more efficiently to generate outputs. Essentially, more profitable banks are generally more efficient, as they have greater resources to invest and manage risks effectively [3, 27]. Regarding the capital adequacy variable, there was a positive relationship between capital adequacy and VRS. This implies that banks with strong capital bases tend to be more efficient than those with weaker capital, as they have greater resilience to absorb losses without facing bankruptcy [1, 29]. For the liquidity

Table 5 Correlation coefficient

Variables	1	2	3	4	5	6	7	8	9
(1) CRS	1.000								
(2) VRS	0.881	1.000							
(3) Size	0.000	− 0.012	1.000						
(4) ROA	0.260	0.195	− 0.198	1.000					
(5) capital ratio	0.210	0.232	− 0.524	0.655	1.000				
(6) Liquidity	0.512	0.356	0.222	− 0.149	− 0.124	1.000			
(7) GDP growth	0.007	− 0.020	0.346	− 0.278	− 0.199	0.375	1.000		
(8) Rule of low	0.155	0.036	0.375	− 0.192	− 0.184	0.660	0.506	1.000	
(9) NPL	0.046	0.162	− 0.439	0.275	0.307	− 0.475	− 0.560	− 0.590	1.000

variable, the analysis revealed a positive, statistically significant relationship between liquidity and both CRS and VRS models [30]. This indicates that banks with higher liquidity levels tend to exhibit greater technical efficiency, as they are more adept at using inputs to produce outputs. Essentially, more liquid banks are generally more efficient, as they possess sufficient funds to meet their obligations efficiently [1, 11]. For the non-performing loans variable, the analysis revealed a positive significant relationship between non-performing loans and technical efficiency models—both CRS and VRS [31]. This suggests that banks with higher levels of non-performing loans tend to exhibit greater efficiency compared to those with fewer non-performing loans. Such banks typically focus on improving their operations by implementing strategies like restructuring, rescheduling, or selling loans at higher prices, which enables them to recover a significant portion of these loans and thereby enhance their efficiency [31].

The results also demonstrated a positive and significant relationship between the Islamic banks variable and technical efficiency. This indicates that Islamic banks tend to be more efficient than conventional banks, likely due to their adherence to Islamic Sharia principles [31–33]. These principles often provide advantages that enhance banks' efficiency, such as a business strategy that shields them from sudden political and economic volatility commonly experienced in the regions studied, including Iran, Jordan, Lebanon, Palestine, and Syria. Table 6

As for the GDP variable, a positive relationship with statistical significance was observed between GDP and VRS efficiency [31]. This suggests that higher GDP leads to increased efficiency in banks' utilization of inputs to produce outputs. Essentially, banks tend to be more efficient in a growing and stable economy compared to a deteriorating one, as economic growth provides opportunities for expansion and growth.

Finally, the rule of law variable exhibits a negative, significant relationship in both CRS and VRS models. This indicates that a strong rule of law adversely affects

Table 6 Pooled results with robust standard errors

Independent variables	Dependent variable	
	CRS	VRS
Bank size	0.00320	0.0129
	(0.0105)	(0.00614)
ROA	2.464**	1.210*
	(0.657)	(0.501)
Capital adequacy	0.0721	0.427*
	(0.314)	(0.181)
Liquidity	1.193***	0.944***
	(0.0740)	(0.0925)
NPL	0.174**	0.268***
	(0.0403)	(0.0533)
Islamic	0.0988***	0.140***
	(0.0143)	(0.0222)
GDP growth	0.130	0.225**
	(0.122)	(0.0740)
Rule of low	− 0.0277**	− 0.321**
	(0.00757)	(0.00710)
Constant	0.0167	− 0.106
	(0.245)	(0.142)
Observations	323	323
R-squared	0.644	0.474

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

banks, as they incur increased administrative costs to comply with legal requirements, leading to a decline in efficiency [17].

6 Conclusion

This research compared the efficiency level of Islamic versus conventional banks and investigated the determinants of banks' efficiency in selected Middle Eastern countries. Efficient resource management is essential for banks to minimize costs, maximize profits, improve competitiveness, and foster customer trust. Effectively managing capital, deposits, and assets enables banks to achieve their objectives with minimal resources, thereby enhancing profitability and customer satisfaction. Across the studied countries—Iran, Jordan, Palestine, Lebanon, and Syria—similar political and economic conditions significantly influence their banking sectors, including

regional instability, inflation, political turmoil, economic challenges, and security risks.

The research findings suggest that Islamic banks tend to exhibit higher efficiency compared to conventional banks. We attribute this trend to their adherence to Sharia principles, which prioritize risk-sharing and discourage usury. Islamic banks prioritize diversification of investments and the provision of specialized financing services, effectively managing inputs and outputs while mitigating risks. Conversely, conventional banks prioritize profit maximization, often engaging in high-risk ventures and offering high-interest loans, thereby increasing their vulnerability to default risks during crises. However, conventional banks outperform Islamic banks in Lebanon and Syria due to regulatory constraints and political pressures, limiting the growth and operations of Islamic banks.

To address these findings, policymakers in Lebanon and Syria are encouraged to consider relaxing restrictions on Islamic banking to promote competition and enhance overall sector efficiency.

The selected Middle Eastern countries need to introduce legislation to promote efficiency and incentivize innovation. Governments can establish efficiency benchmarks and tie bank incentives to performance, encouraging banks to streamline operations and improve performance. Additionally, supporting fintech development will foster innovation and efficiency within the sector.

Transparency measures, such as mandatory financial disclosures and performance reports, are essential for stakeholders to assess banks' efficiency and hold them accountable. Governments should also enact laws to protect clients' rights and establish effective grievance mechanisms to address consumer concerns.

While this study offers valuable insights, it is not without limitations. Firstly, the focus on specific Middle Eastern countries, namely Iran, Jordan, Palestine, Lebanon, and Syria, may restrict the generalizability of the findings to other regions. Additionally, the reliance on secondary data sources, while necessary for comprehensive analysis, may introduce biases or limitations in data quality and completeness. Moreover, the quantitative methods employed in this study may not capture all factors influencing bank efficiency, overlooking qualitative aspects that could provide deeper insights. Furthermore, the exclusive emphasis on efficiency as the sole performance metric may neglect other important dimensions of bank performance, such as stability or customer satisfaction.

Looking forward, future research could address these limitations and expand the scope of inquiry. Comparative studies across diverse regions could help validate the findings and provide a broader understanding of banking efficiency dynamics. Additionally, there is a need to delve deeper into the impact of Sharia-compliant financial products on bank efficiency, as these products play a significant role in Islamic banking systems. Furthermore, exploring the adoption of financial technology (fintech) and its influence on banking efficiency could uncover new

avenues for enhancing performance. Lastly, qualitative studies focusing on organizational and institutional factors affecting bank performance could provide valuable insights complementary to quantitative analyses. By addressing these limitations and exploring new research avenues, future studies can contribute to a more comprehensive understanding of banking efficiency in the Middle East and beyond.

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Marketing Factors Influencing Customers' Purchasing Decisions: Pharmaceutical Products as a Case Study

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Abstract The objective of this research is to investigate the influence of marketing factors on customers' purchasing decisions for pharmaceutical products. These factors include pharmacy location, country of origin of the drug, service provided at pharmacies, pharmacy brand name, and availability of alternatives in the pharmacy. In order to achieve the research objectives and test the hypotheses, a total of 450 questionnaires were distributed to customers from different pharmacies in Jordan. The sample was selected using a simple random sampling method to ensure homogeneity. Out of the distributed questionnaires, 422 were retrieved, resulting in a response rate of 94%. After reviewing the retrieved questionnaires for validity, it was found that 29 questionnaires were not suitable for analysis due to incomplete responses and lack of seriousness from the participants. Therefore, the final number of analyzable questionnaires was 393, accounting for 88% of the total. The findings of the study indicate a significant combined effect of the marketing variables on customers' purchasing decisions for pharmaceutical products. Furthermore, the study reveals that these variables have separate effects with varying degrees of impact, all of which are statistically significant. Among the various marketing factors examined in the study, the availability of alternative drugs in pharmacies was found to have the most significant influence. This was closely followed by the country of origin of the drug, the service provided at the pharmacy, and the brand name of the pharmacy. Interestingly, the location of the pharmacy was found to have the least impact among these factors. The study findings led to a number of recommendations. Firstly, the advice was given that the location selection process be very delicate. The

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second recommendation is to include a wide range of health care services at the pharmacy's disposal, in support of selling drugs as a process. It was also mentioned that diversifying drug options would play a significant role for customers. This is not only by providing different options other than one, but giving customers freedom to select drugs based on their preferences and capabilities. Finally, brand names must match well with the mission statement assigned to the pharmacy.

Keywords Marketing factors · Pharmaceutical products · Purchasing decision · Pharmacies · Jordan

1 Introduction

The pharmaceutical industry has become an integral component of modern national economies, owing to the notable expansion of pharmaceutical factories and the presence of numerous pharmaceutical companies catering to the Jordanian market. These companies consistently strive to develop effective marketing strategies in order to sustain their presence, thrive, and secure a substantial market share. Pharmaceutical marketing plays a vital role in establishing a strong relationship between national pharmaceutical industries and the marketing sector. By effectively distributing pharmaceutical products and enhancing their profitability, marketing contributes significantly to the overall success of the industry. Notably, the pharmaceutical sector in Jordan ranks second in terms of total exports, thereby playing a crucial role in reducing the budget deficit. Jordan's pharmaceutical exports surpass its imports by threefold, underscoring the local pharmaceutical industry's pivotal role in bolstering the national economy. Since the inception of the first pharmaceutical factory in Al-Salt, the number of pharmaceutical factories has proliferated, reaching a total of 20 factories with a registered capital of approximately 250 million Jordanian dinars. The market value of these factories exceeds one billion Jordanian dinars. Moreover, these factories provide direct employment to over 5000 workers and indirectly support an additional 3000 individuals through various industrial services, supply chains, research, packaging, design, advertising, promotion, and other marketing activities. The operational industrial sector of pharmaceutical industries holds significant importance, primarily due to the presence of skilled and experienced local workers. This workforce contributes to the sector's efficiency and effectiveness, making it a crucial component of the overall industrial landscape (Al-Rai Newspaper).

In the present era, there are notable global advancements taking place such as globalization, market economy orientation, trade liberalization, and openness to the external world. These developments have a profound impact on pharmaceutical marketing as a whole, including the marketing of pharmaceutical products. The pharmaceutical industry and pharmacy practice serve as a hub of business and a market characterized by fierce competition, whether operating as an independent business, healthcare institution, or private pharmacy. In order to thrive and maintain their presence in the market, pharmacies that cater to customers (patients) must exert significant

efforts to achieve their desired objectives. It is imperative for them to thoroughly study and comprehend the needs and desires of pharmaceutical customers. Pharmacy management should establish a well-organized relationship with the market and customers, focusing on providing a range of healthcare services that effectively address customers' needs and desires. This approach emphasizes the importance of viewing pharmacy activities as a form of marketing rather than solely a sales-oriented endeavor. Key factors that contribute to the pharmacy's effectiveness in the market include selecting an appropriate location and ensuring the availability of necessary medications, among other considerations [3].

Examining the pharmaceutical industry in the Jordanian market reveals a multitude of pharmaceutical products and alternatives, as well as a significant number of pharmacies, both independent and chain establishments. These factors contribute to a highly competitive environment, with pharmacies striving to offer exceptional services in order to attract and retain customers. The presence of these characteristics poses challenges for companies and pharmacies operating in this sector, necessitating the development of effective marketing methods and strategies to effectively distribute products, engage with customers, and meet their specific needs and preferences. Consequently, marketing decisions play a crucial role in influencing customers' purchasing choices when selecting a pharmacy, particularly in the city of Zarqa, where the study area comprises over 360 pharmacies.

The examination of marketing factors plays a crucial role in understanding the purchasing behavior of customers, particularly when it comes to pharmaceutical products. The objective is to identify the underlying reasons for variations in customers' purchasing behavior and the factors that influence their decision-making process. Therefore, it is imperative for marketers and pharmacy management to thoroughly investigate and comprehend these factors in order to gauge their impact on customer behavior and their decision-making process when it comes to specific pharmaceutical products. Contemporary marketing literature emphasizes the significance of placing the customer at the center of the marketing process. Analyzing the factors that guide customers' purchasing behavior and decision-making aims to determine the extent to which it is possible to influence their choices and align marketing strategies accordingly, with the ultimate goal of attracting and retaining customers.

1.1 Problem Statement

The issue at hand pertains to the capacity of pharmacies and industry professionals to comprehend the needs and preferences of customers, as well as to devise a marketing strategy that aligns with prevailing market conditions. Despite the growing significance of pharmaceutical marketing in contemporary times, numerous pharmaceutical companies and pharmacies encounter challenges in identifying the marketing factors that influence customers' choices when purchasing drugs and medical products. Consequently, their ability to effectively promote their pharmaceutical offerings is hindered. The pharmaceutical industry in Jordan, including establishments in

Zarqa, confronts a multitude of difficulties. These include fierce competition within the market, the impact of rapid external environmental changes, and the unyielding demand for pharmaceutical products. These factors have made it arduous for many companies to attract and retain customers. Moreover, companies and pharmacies operating in the Jordanian pharmaceutical sector face additional obstacles, such as the proliferation of pharmacies and their close proximity to one another, the limited availability of alternative options in pharmacies, the Ministry of Health's enforcement of price uniformity, and the purchasing privileges extended to all pharmacies by drug warehouses. These factors have intensified competition among industry players. Consequently, there has been a growing focus among companies and pharmacies on identifying and analyzing the various marketing factors that influence customers' buying choices. This heightened interest stems from the need to devise innovative marketing strategies that can effectively target a wide range of customers, especially in the midst of intense market competition. Thus, the primary objective of this study is to address a series of research questions that encapsulate the core problem under investigation.

In this study, the primary focus revolves around addressing the fundamental inquiry: To what extent do marketing factors influence the purchasing decisions of customers when it comes to pharmaceutical products obtained from pharmacies operating within the context of Jordan?

2 Hypotheses of the Study

Based on the problem of the study and its objectives, the researchers assumed the following hypotheses:

- **Primary Hypothesis (H0)**: "There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of marketing factors on customers' purchasing decisions for pharmaceutical products from pharmacies operating in Jordan."

2.1 Study Model

The study model was developed by synthesizing existing literature and incorporating relevant variables identified through a comprehensive review. Figure 1 illustrates the sources that informed the design of the model, including studies by [1, 2, 4, 6, 9, 11].

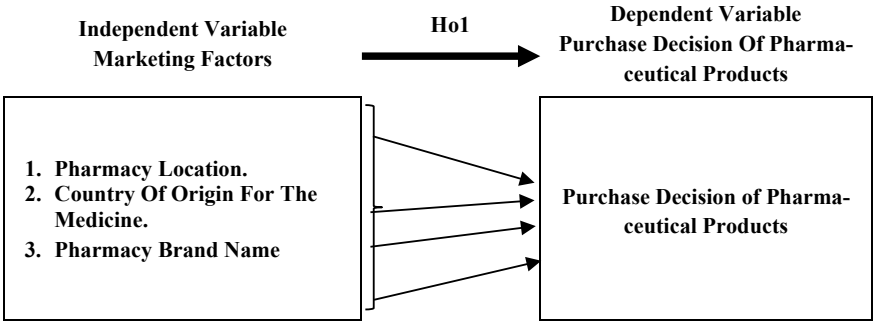


Fig. 1 Study model

3 Theoretical Framework

Marketing factors encompass both internal and external elements and forces that play a crucial role in enhancing an organization's competitiveness, while also influencing the development and execution of its marketing policies and strategies [6].

- **Location**: The establishment in question is meticulously crafted to cater to the requirements, fulfill the aspirations, and embody the attributes that align with the expectations of both clientele and stakeholders. This is the space where individuals associated with the organization are present to facilitate the transfer of advantages from the product to the customers. Furthermore, the physical setting is symbolized by the pharmacy, where patients engage with the pharmacy personnel to acquire appropriate medications that aid in their recuperation from illness or affliction [6].
- **Country of Origin**: The country of origin is a multifaceted concept that can be defined in two dimensions. Some define it as the country where the product is manufactured, while others consider it to be the country where the product is designed.
- **Brand Name**: According to Kotler, the concept of a brand name encompasses a unique and recognizable name or symbol that serves the purpose of identifying and differentiating the goods and services provided by a specific producer or group of sellers. It plays a crucial role in indicating the origin of the product to the customer, while simultaneously safeguarding both the customer and the product from potential competitors who may attempt to offer similar products [10].
- **Service**: According to the scholarly work by Azzam et al. [6], the concept of service can be defined as an intangible activity or benefit provided by one party to another, which does not involve ownership and may be associated with either tangible or intangible products.
- **Alternatives**: Pharmacy personnel engage in a variety of activities that aim to provide significant benefits to customers. These products share common attributes and fulfill identical requirements, allowing for the interchangeability of one alternative with another to yield equivalent advantages [6].

- **Purchase Decision**: According [6], the customer engages in a multifaceted cognitive process with the objective of selecting the optimal options for goods, services, and organizations. This process requires the collection and study of data plus finding appropriate options customized to one's unique situation. The act of purchase decision denotes the selection among various choices available and seeing it as better than others [5, 7, 8].

4 Study Methodology

The researchers used a Sekaran table as a resource for sample selection, aiming to overcome the difficulty of determining the exact number of pharmacy customers without insurance affiliations. In this table provided estimates for both the size of the study population and the appropriate sample size that should be taken into consideration to represent the population accurately. A mathematical approach was then adopted by the researchers in order to come up with another table that clearly illustrated who to be represented as the study population and what would constitute an ideal representative sample.

The researchers chose the maximum value from the table, which pointed out that there should be 384 people in the sample. This number was considered to be the smallest limit that is possible to reach in order for a sample to represent a population. In an attempt to ensure the sample size was appropriate and avoid questionnaires that might not be returned or were unusable for analysis, 450 questionnaires were given to customers from various pharmacies in Zarqa Governorate. The selection of participants was done using simple purposive sampling, which aimed to ensure the similarity of characteristics within the sample.

Upon the completion of the distribution process, the researchers successfully obtained a substantial number of (422) questionnaires, signifying a retrieval rate of approximately (94%). Regrettably, (29) questionnaires were unable to be retrieved, resulting in a minor loss. To ensure the accuracy and reliability of the data, a thorough review of the retrieved questionnaires was conducted. It was discovered that (29) questionnaires were deemed unanalyzable due to incomplete responses and the lack of seriousness exhibited by some participants. Consequently, the final number of analyzable questionnaires amounted to (393), accounting for approximately (88%) of the total questionnaires.

4.1 Study Instrument

A comprehensive questionnaire was carefully devised in order to evaluate the study variables. It was not just any questionnaire; it was made up of a sequence of items, each tailor-made to capture a unique aspect of the variables being probed. These items did not come into existence haphazardly; they were meticulously formulated after

Table 1 The items in the questionnaire

Axis	Number of items
First Part	
Gender	2
Age	4
Marital status	4
Educational level	4
Income	4
Second Part	
Pharmacy location	6
Country of origin	6
Pharmacy brand name	6
Service provided	6
Alternatives available	6
Drug purchase decision	8

Table 2 Likert five-point scale

Response	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Code	5	4	3	2	1

delving deep into the annals of existing literature. The aim was simple yet profound: ensure that they were not only valid but also relevant. But the quest for quality did not stop there. The researchers, in their pursuit of excellence, decided to knock on the ivory towers where distinguished academicians from the realm of marketing resided. Their mission? Seek feedback that would help enrich the questionnaire further: in terms of both comprehensiveness and accuracy. The birth of a questionnaire thus turned into an epic saga where every character (or insight) played a crucial role in shaping its destiny—towards becoming an invaluable tool for this research study.

The questionnaire was bifurcated into two parts: the primary part covered basic details, and the secondary part delved into variables along with their corresponding items. An overview of the count of items in each section is detailed in Table 1.

In the study, a five-point Likert scale was adopted to encode the sample responses to the questionnaire items, as shown in Table 2.

4.2 Reliability

The concept of reliability pertains to the degree of consistency exhibited by questionnaire items, encompassing both the coherence of an individual's responses and the consistency of their rankings in the event of test repetition. Reliability serves as

Table 3 Cronbach's alpha coefficients

Variables	Items	Cronbach's Alpha
Pharmacy Location	Q1–Q6	0.745
Drug Country of Origin	Q7–Q12	0.787
Pharmacy Name	Q13–Q18	0.780
Services Provided	Q19–Q25	0.804
Alternatives Available	Q26–Q31	0.794
Purchase Decision	Q32–Q39	0.846
Overall Performance	–	0.901

an indicator of the anticipated stability in questionnaire responses when the measurement process is replicated for the same individual under comparable circumstances, thus implying a sense of steadfastness.

The questionnaire's reliability was assessed using Cronbach's alpha coefficient (α), which measures the correlation between individuals' responses on different occasions. Cronbach's alpha ranges from (1) to (0). Reliability is considered low if alpha is below (0.4), moderate if it falls between (0.4–0.7), and high if it exceeds (0.7). Table 3 presents the alpha coefficients for the study variables.

The findings from the Cronbach's alpha test indicate that the variables' items exhibit a high level of reliability, surpassing the minimum threshold of 0.7. Among the variables, the items of the Pharmacy Location variable were found to have the lowest reliability coefficient of 0.754, whereas the Purchase Decision variable demonstrated the highest reliability with a coefficient of 0.846. Overall, the items displayed a commendable level of reliability, with a coefficient of 0.901.

4.3 General Information About the Study Sample

The participants in this study exhibit a range of characteristics, which were assessed through a series of questions incorporated into the questionnaire. These characteristics encompass gender, age, marital status, educational attainment, and income. The frequency and corresponding percentages of these characteristics are presented in Table 4.

The analysis of the personal information data from the study sample revealed a notable gender disparity, with males comprising a majority at approximately 62%, while females accounted for approximately 38%. Age information was categorized into four groups, with the age range of 29–38 years being the most prevalent among the participants, representing approximately 37% of the sample. Conversely, the age range of 18–28 years had the lowest representation, constituting only 15.5% of the total sample.

In terms of educational attainment, the study sample individuals were categorized into four distinct levels. Notably, those with a Bachelor's degree accounted for the

Table 4 Description of study sample data

Variable	Personal information	Frequency	Percentage (%)
Gender	Male	243	61.8
	Female	150	38.2
Age	18–28 years	61	15.5
	29–38 years	146	37.2
	39–48 years	89	22.6
	49 years and above	97	24.7
Educational Level	General Secondary or below	66	16.8
	Intermediate Diploma	88	22.4
	Bachelor's Degree	214	54.5
	Postgraduate Studies	25	6.4
Income	$\leq$ 300 JD	93	23.7
	301–500 JD	132	33.6
	501–1000 JD	111	28.2
	> 1000 JD	57	14.5
Marital Status	Single	155	39.4
	Divorced	64	16.3
	Married	155	39.4
	Widowed	23	5.9
Total		393	100

largest proportion, comprising approximately 54.5% of the participants. Conversely, individuals with postgraduate degrees were the least represented, constituting only 6.4% of the sample.

The study focused on analyzing the income levels of individuals, which were classified into four distinct categories. Among the sampled individuals, those falling within the income range of 301–500 dinars constituted the largest proportion, comprising approximately 33.6% of the sample. Conversely, the category with the least representation was individuals earning more than 1000 dinars, accounting for approximately 14.5% of the sample. The researcher postulates that this disparity may be attributed to their affiliation with insurance networks that have contractual agreements with their respective companies.

In terms of marital status, the highest proportion of individuals in the sample were found to be married, accounting for approximately 39.4%, while the lowest representation was observed among widowed individuals, constituting approximately 6% of the sample.

4.4 Description of Study Variables

The study covered a wide range of 6 factors, including the dependent variable, to look at how pharmacy customers liked medication purchasing decisions. We used statistical measures like the mean and standard deviation to figure out where most of the data points lie and how scattered they are around that value. Moreover, we also looked into how important each item was so we could get an idea about what customers typically prefer. The analysis that follows will give you numbers on central tendency, dispersion, and importance for each variable considered in this study.

Pharmacy Location

A total of six items were used to measure pharmacy location as a variable. The results are detailed in Table 5, offering a complete summary of the arithmetic means, standard deviations and relative significance for each item.

The findings presented in Tables 5 indicate that the majority of participants assigned a high level of importance to all aspects of the pharmacy location variable, with the exception of the fourth item. Notably, the first item received the highest

Table 5 The arithmetic means and standard deviations for the items of the pharmacy location variable

Item	Rank	Mean	Standard deviation	Relative importance
1. Preferring dealing with pharmacies near my residence	1	4.61	0.781	High
2. Repeating the purchasing process from pharmacies located on main roads	4	3.94	0.91	High
3. Preferring to buy from pharmacies with multiple locations (pharmacy chain)	5	3.88	1.169	High
4. The presence of the pharmacy within a shopping complex encourages me to deal with it	6	3.62	1.157	Medium
5. The availability of parking space in front of the pharmacy is important for me to deal with it	2	4.04	1.1	High
6. Preferring pharmacies located away from congestion and traffic signals	3	3.98	1.098	High
General Scale	–	4.01	1.035	High

Table 6 Arithmetic means and standard deviations of items of the country of origin variable for pharmaceutical products

Item	Rank	Mean	Standard deviation	Relative importance
7. I am curious to know the country of origin of the medicine I buy from the pharmacy	1	4.01	1.139	High
8. Knowing the country of origin of the medicine gives me a good idea about the medicine	6	3.68	1.139	High
9. I believe that knowing the country of origin gives an idea about the effectiveness of the provided medicine	2	3.81	1.177	High
10. I prefer locally manufactured pharmaceutical products more than foreign ones	3	3.73	1.181	High
11. I prefer locally manufactured pharmaceutical products because of their easy availability	4	3.72	1.27	High
12. I prefer local medicines for their affordable prices	5	3.69	1.21	High
General Scale	–	3.77	1.186	High

average score of 4.61 among all items within the variable. This suggests a unanimous preference among the respondents for pharmacies that are conveniently located near their places of residence.

Among the items analyzed in the study, the fourth item received the lowest average score of 3.62. This score indicates a medium level of importance. Consequently, it can be inferred that the participants in the study do not exhibit a strong inclination towards choosing pharmacies located in shopping complexes.

The findings of the study revealed that the variable of pharmacy location demonstrates a significantly high arithmetic mean of 4.01, indicative of a favorable inclination towards selecting pharmacies based on their geographical proximity.

Country of Origin of the Pharmaceutical Product

The country of origin variable was measured through a detailed compilation of six items, tabulated in Tables 3, 4 for an explicit graphical depiction detailing the means, standard deviations, and relative significance of the components (Table 6).

The average values of all variables related to the country of origin were found to be highly significant in terms of importance. The seventh item stood out with an arithmetic mean of 4.01 (the highest among all items). This underscores participants'

keen interest in knowing and caring about the country of origin prior to any purchase decision.

The eighth item has the lowest arithmetic mean of (3.68) among all the items. Despite this, it still holds significant importance as it highlights the strong association customers make between the country of origin and the perceived quality of the medicine. Customers consider the country of origin as an indicator of quality when making their purchasing decisions.

In terms of the average value for the variable representing the country of origin, it was found to be (3.77), indicating a significant level of importance. The individuals in the sample exhibit a strong preference and keen interest in the country from which the medicine originates.

Pharmacy Name

The measurement of the variable "Pharmacy Name" was conducted through the utilization of a comprehensive set of 6 items. The means, standard deviations, and relative importance of these items are effectively presented in Table 7, providing a valuable illustration of the variable's characteristics.

Among all the items evaluated, the eighteenth item received the highest average score of (3.98), indicating its significant importance. This suggests that the name of the pharmacy plays a crucial role in attracting customers and motivating them to engage with the pharmacy, ultimately leading to increased purchases.

In contrast, item 14 ranked the lowest in terms of arithmetic mean, with a moderate relative importance score of (3.6). This indicates that the connection between a pharmacy's name and medicine does not serve as a significant motivating factor for customers to choose that particular pharmacy.

In general, the variable representing the name of the pharmacy exhibited a considerable level of importance, as evidenced by its high relative importance score of (3.8). This underscores the significant role that the pharmacy's name plays in the attraction of customers to the establishment.

Pharmacy Service

The measurement of the pharmacy service variable consisted of 7 items, which are presented in Table 8. This table provides the arithmetic means, standard deviations, and relative importance values for each item.

The variable pertaining to the pharmacy service displayed significant relative importance across all items. Among these, the nineteenth item emerged as the most relatively important. This is evident from its high arithmetic mean of 4.31, highlighting the crucial role of the service in attaining a competitive edge and influencing customers' choice of pharmacy.

In contrast, item 24 received the lowest average score of (3.9) among all the items, indicating its high significance. This finding implies that a considerable number of pharmacies prioritize post-purchase health check-ups, fostering ongoing communication with their customers.

In general, the variable pertaining to pharmacy services demonstrated a significant level of importance, as evidenced by a relatively high arithmetic mean of (4.08). This

Table 7 Arithmetic means and standard deviations of items of the pharmacy name variable

Item	Rank	Mean	Standard Deviation	Relative Importance
13. The pharmacy's name in Arabic strengthens the relationship between the customer and the pharmacy	2	3.97	1.161	High
14. I believe that a pharmacy's name related to medicine encourages me to deal with it	6	3.6	1.043	Moderate
15. The pharmacy's name on social media platforms continuously enhances customers' trust in the pharmacy	5	3.65	1.205	Moderate
16. The pharmacy's name gives an idea about the type of healthcare service provided in the pharmacy	4	3.76	1.046	High
17. The compatibility of the pharmacy's name with its nature attracts me to deal with it	3	3.87	1.139	High
18. The clarity of the pharmacy's name motivates me to deal with it	1	3.98	1.095	High
General Scale	–	3.8	1.114	High

suggests a prevailing inclination among the individuals surveyed to select pharmacies that provide a comprehensive array of services.

Alternatives Available in the Pharmacy

In relation to the final independent variable, the measurement of the available alternatives within the pharmacy was conducted through the utilization of six distinct items. The means, standard deviations, and the relative importance of these variable items are presented in Table 9.

Among the survey items, Item 26 received the highest mean score of 4.04, indicating that the availability of lower-priced alternatives in the pharmacy has a positive impact on customers' interactions with the pharmacy. The respondents emphasized the significant role of alternative pharmaceutical products in their choice of pharmacy, particularly when considering lower-priced options.

In reference to Item 27, which pertains to the abundance of alternatives available at the pharmacy and its impact on customers, it was rated as relatively less important with a mean score of 3.81. However, it still falls within the category of high relative

Table 8 Arithmetic means and standard deviations of items of the pharmacy service quality variable

Item	Rank	Mean	Standard deviation	Relative importance
19. I believe that the service provided at the pharmacy is a competitive factor that influences its selection	1	4.31	0.989	High
20. Pharmacy staff have sufficient knowledge about the medicines they deal with	3	4.09	0.96	High
21. Pharmacy staff provide sufficient time for medical advice	2	4.18	0.959	High
22. The presence of auxiliary health services in the pharmacy attracts me to it (blood pressure, sugar, weight measurement)	4	4.08	0.975	High
23. The pharmacy providing fast services motivates me to deal with it	5	4.03	1.065	High
24. Pharmacy staff follow up on the customer's health status after purchasing the medicine	7	3.9	1.161	High
25. Pharmacy staff have politeness in dealing with the patient	6	3.97	1.069	High
General Scale	–	4.08	1.025	High

Table 9 Mean and standard deviation of items for the alternatives available in the pharmacy variable

Item	Rank	Mean	Standard deviation	Relative importance
26	1	4.04	1.109	High
27	6	3.81	1.137	High
28	3	3.98	1.052	High
29	5	3.86	1.031	High
30	4	3.91	1.03	High
31	2	4.01	1.09	High
Scale		3.93	1.075	High

importance. Respondents unanimously agree that the availability of alternatives in the pharmacy plays a crucial role in enhancing its reputation among customers. The variable representing the availability of alternatives at the pharmacy obtained a mean

Table 10 Mean and standard deviation of items for the decision to purchase medicines variable

Item	Rank	Mean	Standard deviation	Relative importance
32	3	4.02	1.09	High
33	8	3.85	1.031	High
34	5	3.92	1.035	High
35	2	4.03	1.047	High
36	1	4.04	1.079	High
37	4	4.01	1.01	High
38	6	3.91	1.09	High
39	7	3.92	1.053	High
Scale		3.96	1.054	High

score of 3.93, indicating its significant influence on customers' decision-making process when choosing a pharmacy and making medication-related choices.

Decision to Purchase Medicines Variable

The measurement of the dependent variable, which pertains to the decision-making process surrounding the purchase of medicines, was conducted through the utilization of eight distinct items. The corresponding means, standard deviations, and relative significance of these variable items are presented in Table 10.

The mean values obtained from the analysis reveal that every item pertaining to the decision to purchase medicines carries substantial importance. Particularly, item 36 stands out with the highest relative importance, measuring at 4.04. This finding strongly suggests that the quality of service plays a significant role in influencing the decision to purchase medicines.

Among the items surveyed, Item 33 received a relatively lower mean score of 3.85. However, it is important to note that this item still falls within the category of high relative importance. This finding underscores the significance of the country of origin in influencing customers' decisions when it comes to purchasing medication.

In general, the choice to procure pharmaceuticals exhibited a noteworthy mean value with a substantial relative importance (3.96), indicating the influential role of multiple factors in customers' decision-making process when it comes to purchasing medications.

4.5 Comparison with the Relative Importance of Independent Variables

Table 11 provides a comparison of the means and standard deviations for the independent variables.

Table 11 Mean and standard deviation for items of the decision to purchase medicines variable

Item	Rank	Mean	Standard deviation	Relative importance
Pharmacy location	2	4.01	1.035	High
Country of origin for the pharmaceutical product	5	3.77	1.186	High
Pharmacy trade name	4	3.8	1.114	High
Service provided in the pharmacy	1	4.08	1.025	High
Alternatives available in the pharmacy	3	3.93	1.075	High
Overall scale		3.92	1.087	High

Upon examining the mean values of the independent variables, it is evident that all variables exhibit a considerable level of importance. Notably, the variable pertaining to the quality of service rendered by the pharmacy displayed the highest relative importance, boasting an impressive mean of 4.08. Conversely, the variable associated with the country of origin of the pharmaceutical product showcased the lowest relative importance, with a mean value of 3.77.

The substantial mean of 3.92 for the independent variables signifies the crucial influence of marketing factors in the decision-making process when it comes to purchasing pharmaceutical products.

4.6 The Main Hypothesis

In order to test the main hypothesis, the researchers employed multiple linear regression analysis as a statistical tool. This analysis allowed them to investigate the following research question in a comprehensive manner: To what extent do various marketing factors, such as pharmacy location, drug country of origin, pharmacy name, pharmacy services, and available alternatives in pharmacies, influence customers' decision-making process when purchasing pharmaceutical products from pharmacies in Jordan?

The main hypothesis was tested at a significance level ($\alpha \leq 0.05$), and the results were as follows (Table 12):

- The calculated F value (65.355) was found to be greater than the tabulated value, which indicates a statistically significant effect between the variables.
- To demonstrate statistical significance, the significance level of the test was compared to the significance level adopted in the study. The significance level for F was (0.000), which is lower than the significance level adopted in the study (0.05). Thus, the null hypothesis was rejected and the alternative hypothesis was accepted, indicating a statistically significant impact of marketing factors (pharmacy location, country of origin of the drug, pharmacy brand, services provided

Table 12 Shows the results of the multiple linear regression analysis

Dependent variable	Correlation coefficient (R)	Determination coefficient (R^2)	Calculated F	DF	Significance level (Sig)	Independent variable	B value	t value	Significance level (Sig)
Purchase decision	0.677	0.458	65.355	–	0.000	Pharmacy Location	0.002	0.048	0.961
				5		Drug Country of Origin	0.159	3.829	0.000
				387		Pharmacy Name	0.108	2.67	0.008
						Pharmacy Services	0.165	3.575	0.000
				392		Available Alternatives in Pharmacies	0.433	9.599	0.000

and available alternatives) on customer satisfaction with the decision to purchase pharmaceutical products from pharmacies operating in Jordan.

- The correlation between the independent variables and the dependent variable was inferred using the correlation coefficient (R). The correlation coefficient was found to be 0.677, indicating a strong positive relationship between the combined independent variables (pharmacy location, country of drug origin, pharmacy brand, services provided and available alternatives) and the dependent variable (drug purchase decision). This correlation was found to be significant.
- The results also show an explanatory power of 45.8% for the combined independent variables (pharmacy location, country of drug origin, pharmacy brand, services provided and available alternatives) of the dependent variable (drug purchase decision), as indicated by the coefficient of determination ($R^2 = 0.458$).
- The table shows that the calculated t-values for the independent variables (country of origin of the drug, pharmacy brand, services provided and available substitutes) were statistically significant at the 0.05 level of significance, while the variable (pharmacy location) was not statistically significant. At a significance level of 0.05, with a significance level of (0.961).

4.7 Recommendations

- Pharmacies should choose appropriate locations when establishing pharmacies, taking into account factors such as avoiding traffic congestion and choosing locations near apartment complexes.
- Providing a range of health services in pharmacies, including the sale of medicines, within the capabilities of existing staff. If possible, there should be a pharmacist on duty in the pharmacy who will provide patients with medical advice and guidance and handle electronic payments by cards.
- Constantly provide a variety of drug alternatives and avoid limiting customers to one option by giving them the freedom to choose drugs according to their capabilities.
- Choose the right pharmacy brands that reflect your pharmacy's core mission. Promote your pharmacy brand and available services via social media platforms to attract customers.
- Pharmacists should disclose the country of origin of medicines as it plays a significant role in helping customers make purchasing decisions, reflecting the quality of the pharmaceutical product.

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The Impact of Accounting Conservatism on the Profits of Insurance Companies Listed on a Stock Exchange During the COVID-19 Pandemic



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Abstract The aim of this research is to assess how accounting conservatism impacts the profitability of insurance firms listed on the ASE for a period between 2018 and 2022, taking into account the effects related to COVID-19. The assessment of the level of accounting conservatism was conducted using the Basu model (J Account Econ 24(1), 3–37, 1997 [1]), and other statistical tests were performed to validate the results utilizing the EViews 13 software. The sample for this study consisted of 19 insurance companies that are listed on the ASE. The study findings indicate the presence of accounting conservatism in the financial reports of these companies, as losses were recognized more promptly compared to profits. The results demonstrated a positive and statistically significant influence of accounting conservatism on both Return on Equity (ROE) and Return on Assets (ROA). However, no significant impact of accounting conservatism on Return on Invested Capital (ROIC) was observed. Furthermore, the outcomes did not reveal any significant effect of the pandemic of COVID-19 on the Jordanian insurance companies' profitability. Building on these results, the study proposes several recommendations, including the enhancement of accounting conservatism practices by insurance companies to enhance the quality of their financial reports and bolster investor confidence. It is imperative for regulatory authorities to enforce strict adherence to accounting conservatism standards by insurance companies. Additionally, investors and financial analysts should duly consider the influence of accounting conservatism when assessing the financial performance of insurance firms.

Keywords Accounting conservatism · Insurance companies' profits · COVID-19 pandemic · ASE · Jordan

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1 Introduction

The accounting system heavily relies on the principles of accounting conservatism, which serve as a vital framework for the presentation and preparation of financial statements [2, 3]. Over time, these principles have experienced significant development within accounting practices, assuming a substantial role in the assessment of corporate profits and facilitating sound decision-making. The utilization of accounting conservatism has expanded to encompass a wide range of economic sectors, including the insurance industry [4].

The attainment of profitability serves as a fundamental objective for corporations, serving as a crucial metric for assessing their performance and capacity to endure and expand amidst a dynamic business landscape [5–7]. The advent of the pandemic of COVID-19 introduced novel obstacles for insurance companies listed on the ASE, exerting a direct impact on their financial performance and their capacity to realize desired levels of profitability [8–11].

The global proliferation of the pandemic of COVID-19 has had a great impact on the insurance industry as well as financial services [1, 12–14]. Because cases and deaths are still rising, leading to considerable increases in demand for health and life insurance by people and companies alike. This is likely, in turn, to affect significantly the markets for insurance products and investment portfolio strategies. These changes are foreseen to have a big influence on the financial results and accounting forecasts, say, of such insurance firms [15].

Furthermore, due to the pandemic of COVID-19, a considerable instability has been generated in financial markets that have led to significant fluctuations [16–18]. Market volatility has a cascading impact and it can directly affect the investment portfolios of insurance firms which then contributes towards determining the total value of their assets. As a result, these companies are under pressure to generate reliable accounting estimates so as to ascertain the actual effect on their profit-making level.

An analysis into the impact of accounting conservatism among insurance companies on their earnings through the ASE during COVID-19 can be helpful in understanding how to mitigate risks and, consequently, improve financial gains of such firms later. The findings of this chapter are expected to elucidate new insights into understanding the effects of major economic downturns on the insurance industry as well as other financial markets which might broaden our scope in this area.

The need for a study in accounting conservatism in its effect towards public insurance companies listed on ASE under COVID-19 using the Basu model [1]. This is important because we must not lose sight of what these unforeseen events mean for the performance of this key sector. Thereupon, the study will inspect the different models of accounting conservatism; one being Basu [1], which will help us to establish whether they indeed have an impact on insurance companies' net profit from 2018 through 2022.

1.1 The Problem Statement

Jordan's insurance sector faces many obstacles, notably due to the economic recession which has affected the world market and exacerbated by the pandemic of COVID-19. These challenges emanate from the fierce rivalry among local insurance companies, as well as their competition with regional and international counterparts. Consequently, it is imperative for these companies to adopt a prudent and risk-averse strategy in their operational and investment practices, as this will inevitably impact their financial performance and ultimately their profitability.

By conducting a comprehensive review of various prior studies, such as those conducted by [10], and [8, 13, 19–23], the researchers successfully identified the problem statement pertaining to the examination of the correlation between accounting conservatism.

1.2 Study Model

The design of the study model was formulated by conducting a comprehensive examination of the existing literature pertaining to the subject matter, as well as utilizing the problem statement, hypotheses, and variables outlined in the study. The model encompasses the incorporation of the independent variable of accounting conservatism, which is measured using the Basu model [1]. Additionally, the dependent variables encompass the assessment of insurance companies' profitability, as measured by ROA, ROE, and ROIC.

Based on [1–14, 16–27, the model was conducted by the researchers (Fig. 1).

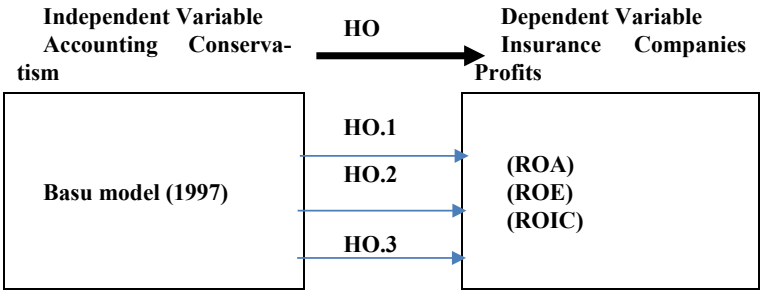


Fig. 1 Study model

2 Hypotheses of the Study

Building on the study problem and the questions thereof, the following were formulated:

Main Hypothesis

- H0: "There is no statistically significant effect at a significance level of ($0.05 \geq \alpha$) of accounting conservatism using the Basu [1] model on the profits of insurance companies listed on the ASE."

Subsidiary Hypotheses

- H0.1: "There is no statistically significant effect at a significance level of ($0.05 \geq \alpha$) of accounting conservatism using the Basu [1] model on the profits of insurance companies listed on the ASE measured by ROA."
- H0.2: "There is no statistically significant effect at a significance level of ($0.05 \geq \alpha$) of accounting conservatism using the Basu [1] model on the profits of insurance companies listed on the ASE measured by ROE."
- H0.3: "There is no statistically significant effect at a significance level of ($0.05 \geq \alpha$) of accounting conservatism using the Basu [1] model on the profits of insurance companies listed on the ASE measured by ROIC."

3 Previous Studies

There exists a lot of literature that explores the link between accounting conservatism and investment. Take for example the work done by [7] who found that there is no positive correlation between accounting conservatism and the effectiveness of investments using market-to-return model, indicating negative association with investment efficiency in public shareholding companies. On the other hand, it reported a situation where accounting conservatism was positively associated with investment efficiency as measured by deviation from expected investment model. Similarly, Yasa et al. [27] found through their study that profit quality receives positive impact from accounting conservatism, therefore an important factor to consider in managerial decisions which affect profit quality.

Al-Khaldi and Abu Al Jaleel [3] found a similarity in the level of accounting conservatism among firms that are listed on Palestine Stock Exchange. However, their investigation could not find any statistically significant impact of the degree of accounting conservatism on profits. On the contrary [2] showed a negative correlation between accounting conservatism and profit management as two variables among the companies traded publicly in Palestine Stock Exchange.

The article of [5] reported a study that looked into how accounting conservatism affects profit quality indicators and the debt level. The findings indicated a notable positive relationship between the level of accounting conservatism and profits sustainability. Although no substantial impact was found regarding the level

of accounting conservatism on profit predictability, it was revealed that there is an adverse effect within firms listed in Saudi Stock Market on their debt levels due to this conservatism practice.

Likewise, investigation delved into the correlation between accounting conservatism and financial performance in commercial banks. The study found a positive connection of conservatism with ROE and return on assets.

Many studies have delved into the effect of accounting standards on accounting conservatism. A case in point is the research by Khreisat et al. where they looked at how Financial Reporting Standard 15 impacts accounting conservatism which was an analysis that used the Basu model as a yardstick. Curiously, these investigations failed to unearth any substantial impact of net assets acting as a mediating variable on accounting conservatism.

Additionally, the research carried out by [9] was aimed at exploring the composition of accounting information systems and their impact on implementing conservatism in accounting. The findings of the chapter showed a positive correlation between how accounting information systems are structured and how much conservatism is applied.

4 Study Methodology

This paper applied the Basu model [1] to assess the impact of accounting conservatism on the earnings of insurance firms in ASE amid COVID-19, based on data collected from their financial reports.

4.1 Study Sample and Population

The research sample encompassed all insurance firms that were publicly traded on the ASE. The study employed financial information extracted from the annual financial reports of these listed firms from 2018 to 2022, resulting in a total of 20 companies. The study sample selection criteria were as follows.

- Exclusion of companies involved in mergers or acquisitions during the study period.
- Exclusion of companies with insufficient data.
- Exclusion of companies subjected to liquidation or trading suspension.

Upon the application of the aforementioned criteria, the study sample was constrained to encompass a total of 19 Jordanian insurance companies that are publicly traded on the ASE. The data available for analysis spanned the duration from 2018 to 2022. It is noteworthy that this selected sample constitutes 95% of the entire population of Jordanian insurance enterprises listed on the ASE.

4.2 Measurement of Variables

The goal of the chapter is to evaluate the influence of accounting conservatism, as measured by the Basu model [1], on the financial performance of insurance firms listed on the ASE during the COVID-19 crisis. To accomplish this, the study compared the degree of conservatism, as indicated by the Basu measure, between the pre-COVID-19 periods (2018–2019) denoted by the dummy variable (0), and the COVID-19 period (2020–2022) denoted by the dummy variable (1).

The Independent Variable: Accounting Conservatism

Accounting conservatism serves as the independent variable in this study. Various models are available to gauge the extent of accounting conservatism, and the researcher opted to utilize the Basu model [1] to examine the study hypotheses.

The Basu Model, proposed in 1997, operates under the assumption that accountants have a tendency to acknowledge unrealized losses prior to unrealized gains. In accordance with the Basu model, negative information is promptly incorporated into earnings, while positive information is comparatively slower to be reflected.

Hence, the metric for conservatism entails assessing the disparity in earnings fluctuations between unfavorable news periods and favorable news periods. The Basu model [1] employs a reverse regression analysis, wherein the decrease in earnings (X) is regressed against returns (Ric), as represented by the following regression model:

$$\boldsymbol{X_{i,t}/P_{i,t-1} = \alpha 0 + \alpha 1 DR_{i,t} + \beta 0 R_{i,t} + \beta 1 \left(R_{i,t} \times DR_{i,t}\right)}$$

where:

Xi, t Ordinary earnings per share for company iii in period ttt, equals net income before extraordinary items divided by the number of ordinary shares.
Pi, t Share price at the beginning of period t for company iii.
Ri, t Return on shares, measured by the difference between the market price of shares at the end and beginning of the period, plus dividends.
DRi, t Dummy variable, equals 1 if Ri, t is less than zero, and 0 if Ri, t is greater than zero."

The Dependent Variable: Insurance Companies' Profits

The study used the following indicators to measure insurance companies' profits:

- ROA: The company's capacity to generate profits from its investments, as a reflection of its managerial competence, can be assessed through a calculation that involves dividing the net income (profit after taxes) by the total assets [20] $\textbf{ROA} = \frac{profits\ after\ taxes}{total\ assets}$.
- ROE: The calculation of this metric involves dividing the net income by comprehensive equity. Its purpose is to provide insight into the effectiveness of capital

management and the utilization of financial resources in order to generate a return on investment $\mathbf{ROE} = \frac{net\ income}{total\ assets}$.

- ROIC: The calculation involves the division of net income by invested capital, allowing for the expression of the actual return that the company attains from the capital allocated to different assets [16] $\mathbf{ROE} = \frac{net\ income}{invested\ capital}$.

5 Data Analysis and Hypothesis Testing

To analyze and evaluate the hypotheses, the E-views software was employed. The random effects model was utilized to estimate the Basu model. Three distinct models, namely the ROA model, the ROE model, and the ROIC model, will be employed to assess the hypotheses.

5.1 Estimation of the Basu Model

In the light of Hausman test results, we decided to use the random effects model to quantify Basu [1] model. This model is widely acknowledged for its ability to capture accounting conservatism. It hinges on an interesting behavioral assumption where accountants are said to exhibit greater promptness in acknowledging unrealized losses as opposed to gains. This has been made possible through employment of a new approach; the reverse regression model unveiled by Basu [1] that essentially correlates declining earnings with returns and thus allows us estimate coefficients for this particular model (Table 1).

The analysis findings reveal a positive statistical correlation (which is also significant) between the Return on Stock (RIT) and falling Earnings Per Share (X/P). This can be seen through the value of the regression coefficient, which is 0.2012, and the fact that the *p*-value is less than 5%. On another note, there seems to be a negative relationship that is statistically significant between DR*RIT and X/P with a regression coefficient of − 0.1512 and also a *p*-value below 5%. These results seem to point towards an interesting observation in the accounting practices of Jordanian insurance firms. Indeed, they seem to follow more of an accounting conservatism principle where losses are recognized more promptly than gains which is reflective via financial statements.

The residuals were acquired after estimating the Basu model, representing the portion of unexplained declining Earnings Per Share. These residuals will be used as a check on conservatism in accounting and also applied to test the various hypotheses following the study's evaluation.

Table 1 Estimation of the Basu model

Independent variable: insurance companies' profitability				
Panel least squares				
Sample: 2018–2022				
Periods included: 5 periods				
Cross-sections included: 19 companies				
Total observations: 95 observations				
Variable	Coefficient	Std. error	t-Statistic	Prob
C	0.0061	0.0072	0.8434	0.4017
DR	0.0108	0.0086	1.2493	0.2155
RIT	0.2012	0.0618	3.2550	0.0017
DR*RIT	− 0.1512	0.0713	− 2.1207	0.0373
R	0.8509			
R^2	0.7240			
Adjusted R-squared	0.6446			
F-statistic	9.1197			
Prob (F-statistic)	0.0000			
Durbin-Watson stat	2.0657			

5.2 Hypothesis Testing (ROA Model)

To examine the influence exercised by accounting conservatism on the ROA in insurance companies listed on the ASE, a multiple linear regression model was employed. Additionally, a dummy variable was included to account for the pandemic of COVID-19 period. The presence of autocorrelation was addressed through the utilization of the GLS-PCSE method. The outcomes of the initial hypothesis test are presented in Table 2.

The results reveal a statistically significant positive correlation between ROA and accounting conservatism. This is reflected in the regression coefficient of 30.71 with a *p*-value less than 1%, suggesting that with every uptick in conservatism levels, ROA is expected to surge by 30.71 units—all other factors held constant. Additionally, findings point towards insignificance of COVID-19 era on ROA; the *p*-value surpassing 5%. Ergo, it can be deduced that profitability among Jordanian insurers remains unperturbed by the pandemic period—an indirect implication from this analysis.

The results lead us to reject the primary null hypothesis (H0.1) and support the alternative hypothesis, implying that there is indeed a considerable and statistically meaningful effect of accounting conservatism on ROA in Jordan's insurance industry during the study period.

Table 2 Results of the first hypothesis test

Dependent variable: ROA				
Method: generalized least squares (GLS) panel estimation (cross-section weights)				
Sample: 2018–2022				
Periods included: 5 periods				
Cross-sections included: 19 companies				
Total observations: 95				
One-step weighting matrix linear estimation				
Dependent variable: ROA				
Variable	Coefficient	Std. error	t-Statistic	Prob
BASU	30.7100	4.8252	6.3646	0.0000
COVID	− 0.4960	0.2930	− 1.6930	0.0938
C	2.1796	0.2133	10.2202	0.0000
R	0.4905			
R^2	0.2405			
Adjusted R-squared	0.2240			
F-statistic	14.5700			
Prob (F-statistic)	0.0000			

5.3 Hypothesis Testing (ROE Model)

To study the effect of accounting conservatism on ROE for insurance firms in ASE, the multiple linear regression model was used, which controlled for the impact of COVID-19 by using a dummy variable. To address the issue of autocorrelation, the GLS-PCSE method was utilized. The results concerning the second hypothesis test are outlined in Table 3.

The findings demonstrate a notable and statistically significant impact of accounting conservatism on the ROE, as evidenced by a regression coefficient of 68.78 and a *p*-value below 1%. This implies that for every unit increase in the level of accounting conservatism, there is an associated increase of 68.78 units in the ROE, while controlling for other variables. Furthermore, the results indicate that the pandemic of COVID-19 period (COVID) does not have a significant effect on the ROE, given that the *p*-value exceeds 5%. This outcome aligns with the earlier findings regarding the impact on the ROA.

Upon analyzing the findings, it is evident that the second null hypothesis (H0.2) can be refuted, thereby accepting the alternative hypothesis. This signifies that there exists a substantial and positive impact of accounting conservatism on the ROE within Jordanian insurance firms throughout the duration of the study.

Table 3 Results of the second hypothesis test

Dependent variable: ROE				
Method: generalized least squares (GLS) panel estimation (cross-section weights)				
Sample: 2018–2022				
Periods included: 5 periods				
Cross-sections included: 19 companies				
Total observations: 95				
One-step weighting matrix linear estimation				
Cross-section weights (PCSE) standard errors and covariance (corrected for degrees of freedom)				
Variable	Coefficient	Std. error	t-Statistic	Prob
BASU	68.7804	17.2725	3.9821	0.0001
COVID	− 1.3726	1.1588	− 1.1846	0.2392
C	4.2274	0.8580	4.9273	0.0000
R	0.2993			
R^2	0.0896			
Adjusted R-squared	0.0698			
F-statistic	4.5259			
Prob (F-statistic)	0.0133			

5.4 Hypothesis Testing (ROIC Model)

To examine the impact of accounting conservatism on the ROIC in insurance companies listed on the ASE, a multiple linear regression model was employed. Additionally, a dummy variable was included to account for the period of the pandemic of COVID-19. The issue of autocorrelation was addressed using the GLS-PCSE method. The findings of the third hypothesis test are presented in Table 4.

Based on the findings, it can be concluded that there is no statistically significant impact of accounting conservatism on the ROIC, as evidenced by a *p*-value exceeding 5%. Furthermore, the results indicate that the pandemic of COVID-19 period does not have a significant effect on the ROIC, as the *p*-value also exceeds 5%.

After analyzing the obtained findings, it can be concluded that the third null hypothesis (H0.3) is upheld, thus suggesting that there is an absence of a substantial impact of accounting conservatism on the ROIC within Jordanian insurance companies throughout the duration of the study.

Table 4 Results of the third hypothesis test

Dependent variable: ROIC				
Method: generalized least squares (GLS) panel estimation (cross-section weights)				
Sample: 2018–2022				
Periods included: 5 periods				
Cross-sections included: 19 companies				
Total observations: 95				
One-step weighting matrix linear estimation				
Cross-section weights (PCSE) standard errors and covariance (corrected for degrees of freedom)				
Variable	Coefficient	Std. error	t-Statistic	Prob
BASU	0.1985	0.1181	1.6808	0.0962
COVID	− 0.0113	0.0078	− 1.4408	0.1530
C	0.0709	0.0062	11.3562	0.0000
R	0.2169			
R^2	0.0470			
Adjusted R-squared	0.0263			
F-statistic	2.2703			
Prob (F-statistic)	0.1090			

6 Results

The impact of accounting conservatism on ROA in insurance companies listed on the ASE during the pandemic of COVID-19 period was examined using the multiple linear regression model. The findings revealed a significant and positive correlation between ROA and accounting conservatism, as indicated by a regression coefficient of 30.71 and a *p*-value of less than 1%. This implies that for every one unit increase in accounting conservatism, there is a corresponding increase of 30.71 units in ROA, while holding other variables constant. However, it was observed that the COVID-19 period did not have a significant effect on ROA.

In terms of ROE, the findings demonstrated a statistically significant positive impact of accounting conservatism, as evidenced by a regression coefficient of 68.78 and a *p*-value of less than 1%. This implies that a one-unit increase in the level of accounting conservatism results in a corresponding increase of 68.78 units in ROE, while controlling for other variables. Similar to the effect observed on ROA, the pandemic did not exhibit a significant influence on ROE.

In terms of the ROIC, the findings did not indicate any substantial impact of accounting conservatism or the COVID-19 period. Consequently, the null hypothesis, which posits that there is no notable influence of accounting conservatism on ROIC in Jordanian insurance firms throughout the duration of the study, was upheld.

7 Recommendations

- Compliance with international accounting standards has to be enhanced.
- Accurate transaction documentation and clear and transparent financial reporting ensure the quality of financial data and increase investor confidence.
- Insurance companies should direct their investments towards high-return areas, which can benefit shareholders and increase their ROA and equity.
- Strengthen the financial and investment management strategies to achieve maximum return on appropriate risk, thereby achieving your long-term financial goals.
- Continuously monitor the impact of economic and environmental conditions, including pandemics such as COVID-19, and take necessary actions to mitigate negative impacts and capitalize on any positive opportunities that may arise.
- Conduct more research to examine the impact of firm characteristics such as size, leverage, and ownership structure on the relationship between accounting conservatism and profitability.
- Investigate the impact of accounting conservatism on other aspects of financial performance, such as market value and cost of capital.
- Conduct comparative research between different countries aimed at understanding the impact of institutional and cultural factors on accounting conservatism practices and their impact on financial performance.

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The Impact of Green Accounting Disclosure on the Financial Performance of European Industrial Companies During the Period 2010–2022



Ghassan Daas and Nour Abu Ridi

Abstract This study examines the impact of green accounting disclosure on financial performance indicators of European industrial companies during the period 2010–2022, as eight indicators of green accounting disclosure were used as independent variables, and these indicators were considered dummy variables with an amount of **(0**, **1)**, and the ROA**, ROE and EPS** dependent variables, and the data were extracted from the DataStream database for 1050 firms. Using multiple regression analysis, the results of the study showed a variation in the effect of green accounting disclosure indicators on the financial performance indicators of industrial companies. Environmental Expenditures Investments, Environmental Expenditures, Environment Management Team, Policy Energy Efficiency, Renewable Energy Use, Policy Emissions, and Environmental Supply Chain Management have a positive effect on the ROA, ROE, and EPS with different level. The firm size as control variable affects the impact of the green accounting disclosure on the financial performance. Finally, the study recommended a set of recommendations, including that regulations and instructions related to green disclosures and sustainability disclosures be taken into account within the company's internal strategies, and disclosures should be provided periodically to stakeholders to preserve the company's funding sources, which fundamentally affect the companies' financial performance indicators.

Keywords Green accounting · Financial performance indicators · ROA · ROE · Green accounting disclosure indicators

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1 Introduction

The environmental disturbance is increasing significantly day after day, and what helped intensify this is the industrial revolution that occurred in the late eighteenth century, when the most difficult technological or mechanical system was authorized to carry out traditional work instead of human hands [1]. We do not deny that companies provide financial reports, but at the time they failed to recognize the extent of the impact of their economic activities on the surrounding environment [2]. The concept of green accounting emerged, which calls for the process of integrating environmental costs and financial operations in a way that serves the interest of the institution and the surrounding environment, which reflects the possibility of achieving a balance between making money, people's lives, and the health of the planet [3].

Disclosure is one of the basic and necessary methods that help decision-makers make the correct decisions and thus follow green accounting standards disclosing them in the company's financial reports is one of the most important ways to know the extent of the company's responsibility toward the environment [4]. As a result of the increasing environmental risk, it has become one of the most important ways to know the extent of the company's responsibility towards the environment. It is necessary to implement environmentally friendly measures by institutions and disclose them [5].

The goal of green accounting, known as environmental accounting, is to take into account the environment and its sustainability by including environmental impacts in financial reports, and the fact that the industrial sector is one of the most important economic sectors that has the greatest impact on the environment, as it includes the manufacture of many products, some of which have environmental emissions and environmental damage. It has become a must to find out whether there is a relationship between green accounting disclosure and the financial performance of industrial companies [5].

The financial performance indicators only provided insight into an organization's financial well-being through measures such as liquidity and profitability. However, the concept of financial health has evolved and is now evaluated by considering the effective allocation of resources that incorporates both environmental costs and profitability. This approach supports sustainable growth. According to [2] highlights the importance of evaluating financial and environmental performance to achieve profitability. However, the disclosure of green accounting is still voluntary as there are no specific accounting standards regulated for this purpose. Nevertheless, SFAS No. 1 of 2009 allows companies to provide additional services in financial reports related to the environment and value-added services, especially in specific industries [6].

The unique role of social responsibility allows companies to acquire strategic resources for development, which in turn helps them earn the trust of consumers. By assessing their environmental costs and estimating their resource losses within the country, companies can demonstrate their commitment to social responsibility. It is important to note that disclosing social responsibility, whether through financial

reports or company websites, can significantly increase transparency and positively impact the long-term sustainability of the company [7].

Water and air pollution are major environmental disasters that need to be addressed. Striking a balance between environmental development and the economy is important, and this can be achieved through the use of green accounting strategies. Recently, it has been recommended that the environmental and economic accounting systems be linked by connecting natural assets accounts to income and production accounts. This follows the basic principle of national accounts and allows for the evaluation of natural resources and productive capital at any given time [4].

Green accounting, and according to previous studies [1] the concentration were on the disclosure of Environmental Expenditures Investments, Environmental Expenditures, Environment Management Team, Policy Energy Efficiency, Renewable Energy Use, Policy Emissions, Environmental Supply Chain Management and Environmental R&D Expenditures. Which is the main components collected in a formal procedure from the European firms and accordingly disclosed in the published database (**DataStream** data).

2 Problem Statement

According to [8] the industrial revolution that took place in the late eighteenth century has caused significant environmental damage worldwide. Due to the conflicting interests of institutions and the local communities in which they operate, it has become essential to strike a balance between economic and environmental interests. This is why accounting contribute for, specifically green accounting, which is crucial in reducing the ecological footprint of companies and demonstrating their environmental responsibility. By disclosing their green activities in their financial reports, companies can show their commitment to the environment.

Green accounting is a type of accounting that attempts to factor environmental costs into the financial results of operations, and companies that disclose environmental information are, on average, larger in terms of total assets and income, owe more and provide a higher return on investment. So, environmental disclosure is a determinant of the company's profitability or value [9]. Accordingly, this study try to examine the green accounting disclosure and the firm's performance, and the study problem aimed to answer research question of "What is the impact of green accounting disclosure on the financial performance of European industrial companies listed on the European Stock Exchange for the period 2010–2022?"

3 Objectives of the Study

This study aims to investigate the effects of green accounting disclosure on the financial performance of European industrial companies listed on the European Stock Exchange for the period 2010 to 2022. The study aims to achieve the following objectives:

- Determine whether companies are capable of making green accounting disclosures either within their financial reports or in a separate report.
- Analyze the impact of green accounting disclosure on the return on assets, return on equity, and earnings per share.
- Identify the impact of green accounting disclosure on the financial indicators, considering company size and quality management as control variables.

4 Research Importance

Green accounting is a comprehensive field that is utilized at all levels of accounting. Its primary goal is to provide accounting information to the makers and users of internal and external financial reports. This type of accounting is also utilized to identify different environmental investments to gain profits and avoid environmental accountability [10]. Many countries are still struggling to balance environmental preservation with economic development. To achieve this balance, it would be beneficial for them to adopt accounting practices related to green accounting and incorporate disclosures related to environmental impact in their financial reports [3].

All business looks for sustainability, to survive and to be going concern. So, it is important to investigate whether there is a correlation between green accounting disclosure and a company's performance. Recently, financial accounting has been a major topic of research due to its role in sustaining the environment by striking a balance between development and environmental protection while also achieving societal returns [11].

5 The Theoretical Framework and Hypotheses Development

Financial indicators play a crucial role in providing information about a company's financial performance and its ability to meet its obligations. They also help evaluate the company's work, determine the level of its administrative success, and ensure legal compliance.

Legitimacy theory: according to [12] "Legitimacy theory is crucial in explaining the organization's behavior in implementing and developing social responsibility

policies, and then communicating its results. It treats corporate social and environmental performance and disclosure of this information as a way to fulfill the organization's social contract that enables the recognition of its objectives." Also, "Theory of legitimacy asserts that the organization seeks to ensure that they are perceived as operating within the bounds and norms of their respective societies, that is they attempt to ensure, that their activities are perceived by outside parties as being "legitimate" [13]

Green accounting: according to [14] companies need to understand environmental reports to increase their knowledge and awareness of their responsibilities towards the environment. The local government can also use these reports to understand an organization's environmental practices. Green accounting is viewed as an accurate source of information on an organization's impact on the environment. It is often disclosed in the company's environmental report or through collective disclosure [1]**.**

Return on assets: The rate of return on assets is one of the most important traditional financial indicators that are used to measure a company's performance and indicate the extent of its ability to achieve an appropriate return on assets [1, 15]. It was found that there is a close and positive relationship between environmental disclosure and the rate of return on assets [16, 17]**.** So, the first hypothesis can be set as:

H01: *There is positive impact of disclosing green accounting on the return on assets of European industrial companies listed on the European Stock Exchange for the period 2010–2022.*

Return on equity: according to [18] this indicator has great importance in attracting investors and plays a vital role in comparing institutions, especially in the industrial sector. Green accounting and practices lead to an increase in company profits, making this indicator one of the most crucial financial indicators. Social spending can also lead to an improved return on equity. Therefore, the disclosure of green social practices has a positive relationship with the return on equity [15–17]. So, the second hypothesis can be set as:

H02: *There is positive impact of disclosing green accounting on the return on equity of European industrial companies listed on the European Stock Exchange for the period 2010–2022.*

Earnings per share: Earnings per share is a crucial financial indicator that investors use to calculate expected profits and revenues from investing in a company's ordinary shares. The disclosure of green accounting significantly impacts the EPS. A positive disclosure of green accounting can boost demand for the company's shares and increasing its trading value. Therefore, companies should prioritize disclosing their green accounting practices to attract more investors and improve their financial performance [17]**.** So, the third hypothesis can be set as:

H03: *There is positive impact of disclosing green accounting on the earnings per share of European industrial companies listed on the European stock exchange for the period 2010–2022.*

Company size: Large companies have access to multiple financing sources, which gives them the ability to perform better and have stronger support. This strength can be reflected in the level of disclosure they provide. For instance, industrial companies, being large in size, have higher disclosures and more accurate information compared to smaller companies. This positive relationship between company size and disclosure can be useful for companies that are committed to green environmental practices [19]. So, the fourth hypothesis can be set as:

H04: *There is positive impact of green accounting disclosure on the financial performance of European industrial companies listed on the European Stock Exchange for the period 2010-2022in light of the presence of company size as a control variable.*

Quality Management: according to [11]**,** it is crucial to prioritize quality management within an organization. This administrative task is aimed at upholding a high level of product quality, which in turn plays a positive role in preserving the environment. Quality management is not limited to the product itself but also extends to the workers who are trained to produce high-quality products. The quality of these products is measured by the amount of expenses incurred, both on the product and on the workers. So, the fifth hypothesis can be set as:

H05: *There is positive impact of green accounting disclosure on the financial performance of European industrial companies listed on the European Stock Exchange for the period 2010-2022in light of the presence of quality management as a control variable.*

6 Methods and Procedures

6.1 Data collection methods

The study collected data from the DataStream database (DataStream is a global financial and macroeconomic time-series database, providing data on equities, stock market indices, currencies, company fundamentals, fixed income securities and key economic indicators for 175 countries and 60 markets) [20], which covered the period (2010 to 2022). The companies had to be listed on European stock exchanges for the period 2010 to 2022. Data for 1050 firms were collected. Moreover, all information and disclosures related to green accounting indicators and financial indicators had to be available. For each of the green accounting disclosure the sample was selected on the data availability by each green accounting disclosure variable. Table 1 illustrates the number of observation through the study period (2010–2022) for each

Table 1 Study sample

Variable	Observations	Variable	Observations
1.EEI = Environmental expenditures investments	5192	2-EE = Environmental expenditures	1109
3-EMT = Environment management team	5642	4-PEE = Policy energy efficiency	5648
5-REU = Renewable energy use	5640	6-PE = Policy emissions	5948
7-ESCM = Environmental supply chain management	5640	8-ERD = Environmental R&D expenditures	277

variable. No consistent disclosure for all variables. So, each variable was analyzed independently for its impact of the financial performance indicators

6.2 Variables

Table 2 Presents the Study Variables, Their Types, Scientific Terms, Measurement Mechanisms, and Sources of Information.

A regression model was developed to determine the effect of green accounting disclosure on the financial performance of European industrial companies listed on the European Stock Exchange.

Regression model —— $FP = \alpha 0 + \beta 1GACC + \beta 2FSIZ + \beta 3QMAN_{+} \varepsilon$.

Where: FP: Financial performance indicator, GACC: Green accounting disclosure variable, FSIZ: Firm size, QMAN: Quality Management.

7 Results

The total number of 1050 European industrial companies for the period (2010 to 2022) were surveyed. The study examined a set of green accounting disclosure indicators and financial performance indicators. The selected period was based on the availability of data related to green accounting disclosure indicators, which was only available from the year 2010.

To ensure that the data used for the statistical analysis was complete and error-free, any missing data was excluded from the sample. The green accounting disclosure

Table 2 variables definition and measurement

Variable	Variable type	Definition of variable	Measurement mechanism	Source of information
Green Accounting disclosure 1- EEI = Environmental Expenditures Investments 2-EE = Environmental Expenditures 3-EMT = Environment Management Team 4-PEE = Policy Energy Efficiency 5-REU = Renewable Energy Use 6-PE = Policy Emissions 7-ESCM = Environmental Supply Chain Management 8-ERD = Environmental R&D Expenditures	Independent	It is the impact of human activity on the Earth's environmental systems and resources, and it is an accounting that calls for a balance between the organization's interest and the environmental interest [1]	The impact of green accounting disclosure is measured by examining a group of environmental indicators within companies' reports and giving the code (1) to companies that disclose these indicators and the code (0) to companies that do not disclose these indicators	Data published in)DataStream)
Return on assets	Dependent	It is an indicator used as a measure to determine the amount of profits generated on average per unit of assets	Calculated through the following equation: net profit after tax/ total assets [21]	Data published in (DataStream)
Return on equity	Dependent	It is an indicator used as a measure to determine the returns of shareholders and the potential growth of their investments	Net profit after tax / Equity [21]	Data published in (DataStream)

(continued)

Table 2 (continued)

Variable	Variable type	Definition of variable	Measurement mechanism	Source of information
Earnings per share	Dependent	It is the ratio that indicates shareholders' profits	(Net profits after tax - dividends on preferred shares)/number of common shares [22]	Data published in (DataStream)
Quality Management	Control	It is a measure used to express the extent of the company's interest in the degree of efficiency of its products and their distinction from other products	It is measured by all expenses spent on the product and also by workers to produce the best they can [11]	Data published in (DataStream)
Company size	Control	Large companies enjoy a high volume of financing sources, and therefore they have great strength in support and great strength	Natural logarithm of total assets, [19]	Data published in (DataStream)

indicators were then organized to measure their impact on the financial performance indicators. And, additionally, the study examined the impact of company size and quality management as control variables. All the regression models for the eight independent variable indicates VIF less than 5, which indicates no multicollinearity problems.

8 The Impact of Disclosing Environmental Expenditure Investments (EEI) on Financial Performance (ROA, ROE, EPS)

Firms through its social and environmental responsibility have to invest in environmental protection, such investment will gain the reputation of the firm's equity. Results in Table 3 indicates that there is a significant positive impact of the of the environmental expenditure investment on the financial performance indictors (0.88, 9.975, and 0.117) for ROA, ROE, and EPS respectively. The most positive impact was for the ROE. The values of R square before and after the inclusion of the control variables are significant, then the model is fit.

By adding the control variables (Firm size) and (Quality management), the results were show significant impact of on ROA and ROE belongs to the firm size, and the

Table 3 The Regression analysis on the impact of disclosing environmental expenditures Investments (EEI) on financial performance) ROA, ROE, EPS)

Dependent variable		Coefficient	R square/Sig	Sig coefficient	Result					
ROA		0.880	0.002/0.001	0.001 < 0.05	Significant impact					
ROE		9.975	0.001/0.026	0.026 < 0.05	Significant impact					
EPS		0.117	0.002/0.001	0.001 < 0.05	Significant impact					
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R square/Sig	**With size**			**Quality management**			**EEI**		
		Coefficient	Sig	VIF	Coefficient	Sig	VIF	Coefficient	Sig	VIF
ROA	0.014/0.00	1.407	0.00	1.664	− 3.818E−12	0.396	1.487	0.043	0.884	1.155
ROE	0.005/0.00	12.928	0.000	1.664	1.282E−11	0.862	1.487	1.686	0.725	1.155
EPS	0.004/0.00	0.045	0.090	1.664	5.479E−13	0.351	1.487	0.082	0.032	1.155

quality management insignificant for all dependents. The overall impact of the control variable on EEI, only significant for EPS. The results indicate the control variables affect the results of ROA, and ROE.

8.1 The Impact of Disclosing Environmental Expenditure (EE) on Financial Performance (ROA, ROE, EPS)

Firms through its social and environmental responsibility have to pay expenses for environmental protection, such expenses if disclosed will gain the reputation of the firm's equity. Results in Table 4 indicates that there is light significant positive impact of the environmental expenditure on the financial performance indictors (very low impact) for ROA, ROE. Compared to the environmental expenditures investment, the investment is more impact and seen on the ground. The values of R square are insignificant for all models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for ROA and EPS, then the model is fit when it is significant by adding the control variables. The results also show significant impact of on ROA belongs to the firm size, and the quality management significant for ROA and EPS. The overall impact of the control variable on EE, only significant for EPS. The results indicate the control variables affect the results of ROA, and EPS.

9 The Impact of Disclosing Environment Management Team on Financial Performance ROA, ROE, and EPS

Managing the environmental impact with its policies, investment, and procedures needs to be driven by highly qualified team. Results in Table 5 indicates that there is a significant positive impact of the of the environmental management team on the financial performance indicators of ROA and EPS (1.013, and 0.89) for ROA, and EPS respectively, but with no significant impact for ROE.. The most positive impact was for the ROE even it insignificant. The values of R square are significant for ROA and EPS models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for all dependents. The results also show significant impact of on ROA and ROE belongs to the firm size, and the quality management insignificant for all models. The overall impact of the control variable on EMT, insignificant all dependents. The results indicate the control variables affect the results of ROA, and EPS. Table 5

Table 4 The Regression results on the impact of disclosing environmental expenditures (EE) on financial performance) ROA, ROE, EPS)

Dependent variable		Coefficient		R square/Sig	Sig coefficient	Results				
ROA		7.212E−13		0.001/0.384	0.384	No significant impact				
ROE		2.371E−13		0.000/0.994	0.994	No significant impact				
EPS		1.468E−15		0.000/0.985	0.985	No significant impact				
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With size**			**Quality management**			**EE**		
		Coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.026/0.00	-0.975	0.014	1.795	- 4.239E-12	0.000	1.795	7.2 E-13	0.373	1.000
ROE	0.006/0.091	28.412	0.060	1.795	6.181E-12	0.984	1.795	1.62 E-13	0.996	1.000
EPS	0.018/ 0.00	-0.072	-0.14	1.795	6.381E-13	0.000	1.795	2.09 E-15	0.000	1.000

Table 5 The Regression results on the impact of **disclosing Environment Management Team** (EMT) on financial performance) ROA, ROE, EPS)

Dependent variable		Coefficient		R square/Sig	Sig coefficient	Results				
ROA		1.013		0.003/ 0.00	0.000	Significant impact				
ROE		5.806		0.000/0.138	0.138	No significant impact				
EPS		0.89		0.001/ 0.04	0.004	Significant impact				
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With Size**			**Quality Management**			**EMT**		
		Coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.015 / 0.00	1.450	0.000	1.655	-4.2E-12	0.315	1.482	0.247	0.349	1.143
ROE	0.005/0.00	12.889	0.000	1.655	6.14E-12	0.927	1.482	-1.348	0.747	1.143
EPS	0.003 /0.001	0.04	0.102	1.655	6.38E-13	0.231	1.482	0.062	0.062	1.143

10 The Impact of Policy Energy Efficiency on Financial Performance (ROA, ROE, and EPS)

Managing the environmental impact with its policies, investment, and procedures that driven by highly qualified team is one side, but the impact of the pollution resulted from energy providers also highly considered. The implementation of policies in efficient manner shall be examined Results in Table 6 indicates that there is a significant positive impact of the of the Policy Energy on the financial performance indicators of ROA and EPS (4.420, and 0.224) for ROA, and EPS respectively, but with negative significant impact was for the ROE. The values of R square are significant for ROA and EPS models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for all dependents. The results also show significant impact of on ROA and ROE belongs to the firm size, and the quality management insignificant for all models. The overall impact of the control variable on PEE, significant ROA and EPS. The results indicate the control variables have no affect the results of ROA, and EPS. Table 6

11 The Impact of Renewable Energy Use on Financial Performance (ROA, ROE, and EPS)

To protect the environment from the pollution impact, the clean sources of energy will decline the pollution percentage, so, the use of renewable energy will affect the protection. Results in Table 7 indicates that there is a significant positive impact of the of the renewable energy use on the financial performance indictors (2.336, 0.109) for ROA, and EPS respectively. The most positive impact was for the ROA resulted from cost reduction on the use of energy sources. The values of R square are significant for ROA and EPS models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for all dependents. The results also show significant impact of on ROA and ROE belongs to the firm size, and the quality management insignificant for all models. The overall impact of the control variable on REU, significant ROA and EPS. The results indicate the control variables have no affect the results of ROA, and EPS.

Table 6 The Regression results on the impact of **disclosing Policy Energy Efficiency** (PEE) on financial performance) ROA, ROE, EPS)

Dependent variable		coefficient		R Square/ Sig	Sig coefficient	Result				
ROA		4.420		0.027/0.00	0.000	Significant impact				
ROE		1.992-		0.000 / 0.724	0.724	No significant impact				
EPS		0.224		0.004/ 0.00	0.000	Significant impact				
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With Size**			**Quality Management**			**PEE**		
		Coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.034/0.00	1.302	0.000	1.556	-1.620E-12	0.698	1.472	3.839	0.000	1.069
ROE	0.005/0.00	13.779	0.000	1.556	9.589E-13	0.989	1.472	-9.952	0.088	1.069
EPS	0.006/0.00	0.031	0.195	1.556	6.900E-13	0.193	1.472	0.200	0.000	1.069

Table 7 The Regression results on the impact of Renewable Energy Use (REU) on financial performance) ROA, ROE, EPS)

Dependent variable		coefficient		R Square/ Sig	Sig coefficient	Results				
ROA		2.336		0.014/0.00	0.000	Significant impact				
ROE		0.012		0.000/0.998	0.998	No significant impact				
EPS		0.109		0.002/0.001	0.001	Significant impact				
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With Size**			**Quality Management**			**REU**		
		coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.022/0.00	1.156	0.000	1.471	-3.146E-12	0.453	1.601	1.750	0.000	1.111
ROE	0.005/0.00	14.086	0.000	1.471	1.524E-12	0.982	1.601	-7.520	0.084	1.111
EPS	0.003/0.00	0.039	0.108	1.471	6.008E-13	0.251	1.601	0.082	0.018	1.111

12 The Impact of Policy Emissions on Financial Performance

To protect the environment from the pollution impact, a policy's effectiveness depends on its ability to exploit possibilities for reducing (energy-related) CO2 emissions across the economy which will decline the pollution percentage, so, the use of a policy's effectiveness of emissions will affect the protection. Results in Table 8 indicates that there is a significant positive impact of the Policy Emissions on the financial performance indictors (2.725, 0.111) for ROA, and EPS respectively. The most positive impact was for the ROE (6.527) even if it is insignificant. The values of R square are significant for ROA and EPS models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for all dependents. The results also show significant impact of on ROA and ROE belongs to the firm size, and the quality management insignificant for all models. The overall impact of the control variable on PE, significant ROA. The results indicate the control variables have an effect on the results of EPS.

13 The Impact of Environmental Supply Chain Management on Financial Performance (ROA, ROE, and EPS)

Environmental supply chain management recognizes the crucial role to be played by the purchasing and the function's involvement in activities that include reduction, recycling, reuse and the substitution of materials. Results in Table 9 indicates that there is a significant positive impact of the Environmental supply chain management on the financial performance indictors (1.466, 8.750) for ROA, and ROE respectively. The most positive impact was for the ROE (8.750). The values of R square are significant for ROA and ROE models before the inclusion of the control variables.

By adding the control variables (Firm size) and (Quality management), the results show that the values of R square are significant for all dependents. The results also show significant impact of on all dependents belongs to the firm size, and the quality management insignificant for all models. The overall impact of the control variable on ESCM, significant ROA. The results indicate the control variables have an effect on the results of ROE. Table 9

Table 8 The Regression results on the impact of Policy Emissions (PE) on financial performance) ROA, ROE, EPS)

Dependent variable	coefficient	R Square/ Sig	Sig coefficient	Results
ROA	2.725	0.011/0.00	0.000	Significant impact
ROE	6.527	0.000/0.224	0.224	No Significant impact
EPS	0.111	0.001/0.010	0.010	Significant impact

In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With Size**			**Quality Management**			**PE**		
		coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.020/0.00	1.198	0.000	1.604	-2.317E-12	0.582	1.479	1.969	0.000	1.103
ROE	0.005/0.00	12.846	0.000	1.604	6.492E-12	0.923	1.479	-1.854	0.742	1.103
EPS	0.003/ 0.001	0.043	0.073	1.604	6.247E-13	0.240	1.479	0.077	0.085	1.103

Table 9 The Regression results on the impact of Environmental Supply Chain Management (ESCM) on financial performance) ROA, ROE, EPS)

Dependent variable		coefficient	R Square/ Sig	Sig coefficient	Results					
ROA		1.466	0.005/0.00	0.000	Significant impact					
ROE		8.750	0.001/0.040	0.040	Significant impact					
EPS		0.031	0.000/0.368	0.368	No significant impact					
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R Square/ Sig	**With Size**			**Quality Management**			**ESCM**		
		coefficient	Sig	VIF	Coefficient	Sig	VIF	Coefficient	Sig	VIF
ROA	0.016/0.000	1.354	0.000	1.710	-3.250E-12	0.445	1.500	0.626	0.032	1.175
ROE	0.005/0.00	12.336	0.000	1.710	1.040E-11	0.877	1.500	0.825	0.858	1.175
EPS	0.002/0.003	0.059	0.019	1.710	5.122E-13	0.339	1.500	-0.010	0.783	1.175

14 The Impact of Environmental R&D Expenditures on Financial Performance (ROA, ROE, and EPS)

Previous research found a positive association of environmental performance with financial performance [23]. Results in Table 10 indicates that there is insignificant impact of the Environmental R&D Expenditures on the financial performance indicators. Also the results still insignificant through adding the control variables. This result due to the role and responsibilities of the firms to pay not to be part of R&D activities. The values of R square are insignificant for all models before and after the inclusion of the control variables.Table 10

15 Conclusions and Recommendations

15.1 Conclusions

The results of the current study showed that environmental expenditure investments and expenditure have a positive impact on the financial performance indicators. The results of the study was in agreement with the study of [22] proving the existence of an impact of green accounting disclosure on both assets and equity the study also showed the positive impact of the index on earnings per share, and therefore the results of the current study agreed with the results of the study of both [17, 2, 24], Which all found a positive impact of green accounting disclosure on financial performance indicators.

The current study also found that there was an impact of the Environment Management Team, which is one of the indicators of green accounting disclosure consistent with. [6],which found an impact of green accounting disclosure on financial performance indicators.The current study concluded that Policy Energy Efficiency affects the return on assets and EPS. The result agreed with a study of [8] that found an effect of green accounting disclosure on the return on assets. Also, the result of the current study differed with the [5], which found an impact of green accounting disclosure on both return on equity and return per share.

The current study found an impact of Renewable Energy Use on financial performance indicators, this agreed with [19], the results. The study also concluded that there is an impact of Policy Emissions on the return on assets, and this study agreed with [18], in that it reached the same result. For the effect of both Environmental Supply Chain Management has an impact on financial indicators, whereas Environmental R&D Expenditures indicates no effect on the financial performance indicators, Therefore, the results of this study [1] agreed with the study that concluded the same result.

The overall conclusion of the results that firms intersted with the envirnmental disclousure that be sensitive and attrachtive to the readers of the reports which mailly consentated on the investment, expenditures, renewble energy, redusing the pollution

Table 10 The Regression results on the impact of Environmental R&D Expenditures (ERD) on financial performance) ROA, ROE, EPS)

Dependent variable		Coefficient	R square/Sig	Sig coefficient	Results					
ROA		1.227E-10-	0.002/0.557	0.557	No significant impact					
ROE		7.598E-10	0.003/0.421	0.421	No significant impact					
EPS		-1.244E-11	0.000/00.793	0.793	No significant impact					
In the presence of QM and company size as control variables								**Independent**		
Dependent variable	R square/Sig	**With Size**			**Quality Management**			**ERD**		
		coefficient	Sig	VIF	Coefficient	Sig	VIF	coefficient	Sig	VIF
ROA	0.007/0.664	-0.940	0.258	2.523	1.337E-11	0.539	6.214	-1.9E-10	0.628	3.722
ROE	0.010/0.545	-2.189	0.559	2.523	1.163E-10	0.237	6.214	-1.12E-9	0.538	3.722
EPS	0.010/0.530	-0.264	0.162	2.523	3.118E-12	0.528	6.214	-2.01E-11	0.826	3.722

and manageing the envirnmental activities. The overall effect of the control variables indicates that the firm size has an impact on the results due to the capacity of the researched firms, whereas the quality management as control vriable have no effect.

16 Recommendations

It is clear that most of the green accounting disclosure components have an impact on the financial performance indicators, so, the research recommend that firms shall enhance expenditures to protect environment as social responsibility for both operating expenses and investments. It is recommended to get more emphases on the reporting issues that disclose the environmental impact as green accounting practices.

Issuing legislations through which bodies can force companies to integrate environmental costs into the companies' strategic and operational plan, in addition to publishing accounting standards and guidelines issued by standard-setting accounting bodies, whether local or international, in order to be held legally accountable for them.

Disclosing costs and matters related to the environment and making stakeholders constantly aware of them that will increase the confidence of investors, whether current or potential, and thus leads to an increase in the company's investments to achieve significant returns.

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Does Board Diversity Matter on Financial Performance?

Abdulnaser I. Nour, Mohammad Talalweh, and Abdul-Hakeem Obeid

Abstract The aim of this study is to examine how the characteristics of boards affect the financial performance of banks that are listed on the Palatine Exchanges. The study uses a quantitative approach to test hypotheses, gathering data on various variables from secondary sources, primarily the annual reports of banks over a ten-year period from 2010 to 2019. Both descriptive and inferential statistical analysis methods are applied to analyze the secondary data. Additionally, panel data regression is utilized to explore how board diversity factors such as gender, age, nationality, education, and experience affect the financial performance of banks, as measured by ROE and ROA. The results indicate that board age diversity has a positive impact on the ROE of banks in Palestine.

Keywords Board diversity · Palestinian banks · Performance

1 Introduction

Modern companies typically focus on improving their financial performance by assessing how efficiently they utilize their skills and resources to generate revenue and achieve desired profits [1, 2]. This measurement provides insights into a company's overall financial well-being during a particular period, facilitating comparisons with similar firms in the same industry or across industries [3]. It is a valuable tool for evaluating a company's financial status over a specified timeframe [4].

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Although financial performance is vital for businesses, it can be affected by the composition of the board. Board characteristics encompass all the qualities and aspects of a company's board that facilitate the effective and efficient pursuit or full achievement of the interests of different stakeholders [5].

Despite its modest economy, Palestine is increasingly adopting effective corporate governance principles. The increasing focus on advancing corporate governance standards by government entities, civil society groups, and the business community demonstrates a heightened acknowledgment of governance's crucial role in creating an attractive investment environment. Consequently, this facilitates the attraction of both local and foreign investments, contributing to enhanced economic growth, lower unemployment rates, reduced poverty levels, and decreased reliance on external assistance [6, 7].

Although the importance of corporate governance is increasingly acknowledged, there is a lack of empirical research investigating how board characteristics relate to the corporate performance of Palestinian companies. Only a handful of studies have delved into this connection within the Palestinian context [6–8]. Examining the link between boards and performance in Palestine is essential for deepening our comprehension of this relationship within the distinct parameters of a small and somewhat isolated economy. This study seeks to fill this gap by exploring how gender, age, nationality, education, and experience diversities impact banks' financial performance using metrics such as ROE and ROA.

Our paper contributes significantly to corporate governance research in the banking sector, echoing the Basel Committee on Banking Supervision's call for more international studies. The banking industry provides a unique setting to explore how board diversity impacts performance, particularly given the global financial crisis aftermath and potential legal liabilities for bank directors. This study is the first known to highlight the importance of bank board diversity in relation to performance within the bank's institutional context.

The rest of the Paper is structured as subsequent sections. Section 2 Literature review and developing hypotheses: Sect. 3 discusses the sample, data, and methodology used for empirical analysis. Section 4 presents the results, while Sect. 5 presents our concluding.

2 Literature Review and Developing Hypotheses

Board characteristics encompass the distinct blend of attributes, traits, and expertise contributed by each member to the decision-making process [9]. In the fields of psychology and organizational management, positive perceptions regarding demographic diversity within workgroups arise from its potential to enhance cognitive task performance, including activities such as planning, idea generation, problem-solving, and decision-making [10]. Research indicates that workgroups with higher diversity levels may operate at a slower pace compared to less diverse ones, as noted by Zwelef and Nour [11] in homogeneous top management teams. However, despite

the potential for conflicts, highly diverse workgroups consistently demonstrate superior performance, as evidenced by Momani et al. [12] in mixed groups. The literature on board diversity highlights a positive correlation with enhanced company performance [13–17]. This impact is attributed to diverse boards facilitating extensive information exchange, fostering effective decision-making processes, and promoting independence while considering the interests of minority shareholders [18–21].

There exist at least five theories supporting a positive correlation between board characteristics and company performance. One of these is the widely recognized agency theory, often discussed in literature on demographic diversity [22–24]. This theory emphasizes the diversity of independent supervisory boards, particularly focusing on their independence, as a means to mitigate agency conflicts. The resource dependency theory, on the other hand, views board diversity as a valuable asset for companies, explaining its benefits across executive and non-executive boards. Diversity within the executive board enhances decision-making, while diversity within non-executive boards improves oversight and advisory functions, thereby impacting decision quality. Researchers frequently utilize this theory to examine the relationship between board diversity and bank performance [22–24].

The stakeholder theory posits a mutually beneficial relationship between companies and stakeholders, necessitating diverse corporate boards to meet their needs. Many studies on board diversity draw upon this theory to explain the inherent connection [25, 26]. The critical mass theory suggests that a minority of board members with specific characteristics, such as age, gender, education, and tenure, make significant contributions to the board's duties and functions once they reach a certain threshold [27]. In the financial sector, this theory has been employed in various studies to explore the relationship between diversity and bank performance [28]. Notably, [28] discovered that having women on boards notably improves bank performance. The positive relationship between gender diversity and performance is evident when boards have at least three female members; however, when the number falls below that threshold, the relationship turns negative.

Lastly, the human capital theory argues that differences in perspectives and roles due to demographic variances constitute a form of human capital. Several studies, including those by Farag et al. [23], Talavera et al. [24], use this theory to explain the associated relationship. Despite the endorsement of a positive correlation between board diversity and firm performance by these five theories, empirical evidence remains inconclusive.

Gender Diversity

Historically, boards were predominantly male-dominated. Introducing women to boards increases gender diversity, which is anticipated to enhance organizational value and performance through fresh perspectives [29]. The impact of board characteristics, particularly in terms of gender, on company performance has been extensively researched. As per [30, 31], some studies have observed a positive influence, while others have reported a negative or insignificant effect. Consequently, building on the aforementioned argument, the first hypothesis can be formulated as follows:

H1: Gender diversity significantly increases on the financial performance of the banks listed on Palestine Exchanges.

Age Diversity

Age diversity in a firm can impact performance positively by enhancing skills, resources, knowledge, and relationships. However, it may also lead to cognitive conflicts and weaker team cohesion, negatively affecting firm performance.

Studies have shown that boards with diverse age groups are associated with enhanced financial performance for companies [32–34]. However, contrasting research suggests a potential adverse effect of age diversity on the social performance of firms [24, 35]. On the other hand, certain studies have found no significant correlation between age diversity and firm performance [36].

H2: age diversity significantly increases on the financial performance of the banks listed on Palestine Exchanges.

Nationality Diversity

While nationality fosters national loyalty, diverse board members bring both potential benefits and communication challenges [37]. Studies in developed economies link nationality of board members to positive financial performance [38, 39]. Similar findings in developing economies exist [40], but consistent evidence is lacking [41].

H3: Nationality diversity significantly increases on the financial performance of the banks listed on Palestine Exchanges.

Experience

Board directors need decision-making experience to qualify. Older boards are thought to bring valuable corporate governance experience. This accumulated experience positively impacts overall efficiency and company performance. The connection between board members' educational background and firm performance may vary, but the theory of constrained resources suggests that higher board experience benefits effective management, especially in group settings, enhancing firm performance [42–44] highlighted the importance of corporate management experience for Public Listed Company (PLC) boards. Additionally, there is a clear correlation between firm performance and directors' seniority.

H4: experience diversity significantly increases on the financial performance of the banks listed on Palestine Exchanges.

Education Diversity

Diverse educational backgrounds, functional experiences, and upper management roles are positively linked to financial performance [45, 46]. This diversity in knowledge fosters varied perspectives in top management discussions, aiding strategic decision-making. While some studies show no correlation between educational heterogeneity in upper management and innovation or decision-making, [47] suggest highly educated members may lack practical knowledge, leading to ineffective decisions. Lower-educated board members may gain valuable practical experience. Anticipated benefits of educational diversity among directors include enhanced analytical thinking from those with higher education and practical expertise from those with lower education, ultimately contributing to optimal strategies and improved financial performance.

H5: education diversity significantly increases on the financial performance of the banks listed on Palestine Exchanges.

3 Methodology

3.1 Population and Sample

The study's target population consists of all banks that were listed on the PEX from 2010 to 2019. The sample is composed of banks that meet two specific requirements: they must have been listed on the PEX during the mentioned timeframe, and comprehensive data on these banks for that period must be accessible. Consequently, the sample includes 7 banks, totalling 70 observations. The study collects the necessary data from the annual reports of these sampled banks, which are publicly available on the PEX website.

3.2 Measurement of Variables

3.2.1 Variables and Their Measurement

This study utilizes three categories of variables. Firstly, the dependent variable focuses on the financial performance of banks listed on the Palestinian exchange, measured through return on assets (ROA) and return on equity (ROE).

Secondly, the independent variables pertain to board diversity, encompassing gender, age, nationality, education, and experience.

Lastly, considering that the unique characteristics of each bank can influence corporate governance practices and potentially impact financial performance, the study includes several control variables in the regression model to address this. These control variables consist of board size, bank age, bank size, bank type, and financial leverage Table 1.

3.3 The Regression Model

In order to examine the impact of board characteristics on the banks performance of Palestinian-listed banks between 2010 and 2019, the following multiple regression model was developed:

$$Y_{it} = B_{0i} + \sum_{j=1}^{k} B_j X_{jit} + \varepsilon_{it} (i = 1, 2, \ldots, N; t = 1, 2, \ldots, T; j = 1, 2, \ldots K)$$

Table 1 Variables and their measurement

Variable	Measurement	Reference
Dependent variable (Financial performance)		
ROA	% of net income to total assets	[48]
ROE	% of net income to total equity	[48]
Independent variables (Board characteristics)		
Gender diversity	% of female members to total members	[49]
Age diversity	Standard deviation of ages of board members	[50]
Nationality diversity	% of foreign members to total members	[50]
Education diversity	% of high education members to total members	[50]
Experience diversity	Std. dev. of board members' years of experience	[50]
Control variables (Bank-specific characteristics)		
Board size	Total number of board members	[49]
Bank age	Total number of years since incorporation	[49]
Bank size	Natural log of total assets	[49]
Bank type	0 if commercial bank, 1 if Islamic bank	[49]
Bank leverage	% of total liabilities to total assets	[49]

4 Result and Discussion

4.1 Descriptive Statistics

In Table 2 The study finds that return on assets (ROA) has a mean value of 0.010, indicating a $0.010 profit on average for every dollar invested in assets, ranging from − 0.060 to 0.052. Gender diversity shows a mean of 5.3% females on boards, varying from 0 to 33%. The age dispersion of board member's averages 10 years (7.4–13.7), while foreign board members average 20% (0–62%).Board experience has a mean dispersion of 3.5 years (0–7.2), and 57% of board members hold high education degrees (23–100%). Palestinian banks have an average of 10 board members (6–13), an average age of 27 years (14–59), and an average asset size of $952 million ($11.3 million to $5,260 million). The average financial leverage is approximately 76% (8–92%).

Table 2 Descriptive statistics of variables for Palestinian banks

Variable	Minimum	Maximum	Mean	Std. Dev
Dependent variable (Financial performance)				
ROE	− 0.069	0.183	0.071	0.052
ROA	− 0.060	0.052	0.010	0.015
Independent variables (Board diversity)				
Gender diversity	0.000	0.330	0.053	0.078
Age diversity	7.350	13.740	10.073	1.425
Nationality diversity	0.000	0.620	0.199	0.191
Experience diversity	0.000	7.150	3.532	2.097
Education diversity	0.230	1.000	0.569	0.183
Control variables (Bank-specific variables)				
Board size	6.000	13.000	9.714	1.787
Bank age	14.000	59.000	27.714	13.348
Bank size ($million)	11.366	5,260.000	952.00	1,1140.000
Bank type	NA	NA	NA	NA
Bank leverage	0.075	0.920	0.758	0.274

5 The Matching Function Approach

5.1 Statistical Analysis

Both descriptive and inferential statistics are employed in the data analysis process. Descriptive statistics, such as minimums, maximums, standard deviations, and means, are utilized to provide a descriptive overview of the dependent, independent, and control variables in the study.

Conversely, inferential statistics are used to explore the influence of board characteristics on the financial performance of banks. Specifically, panel data regression is utilized to investigate this impact on the financial performance of banks listed on selected Middle Eastern Exchanges. This technique is chosen due to the panel nature of the data, which includes both time series and cross-sectional elements.

Finally, it is worth saying that the descriptive and inferential data analysis is carried out using the SPSS software.

5.2 Panel Regression Model Analysis

Table 3 presents the panel regression results for Palestinian banks with return on equity (ROE) as the dependent variable. The model, comprising five diversities and

Table 3 Regression results for Palestinian banks using ROE

Constant and variables	Coefficient	Std. error	t-statics	Sig.
Constant	− 0.190667	0.073677	− 2.58788	0.0121
Gender diversity	− 0.038449	0.128364	− 0.299531	0.7656
Age diversity	0.008661	0.00342	2.532326	0.0140*
Nationality diversity	− 0.039207	0.036304	− 1.079957	0.2846
Education diversity	0.019268	0.043121	0.446827	0.6566
Experience diversity	0.004321	0.003265	1.323518	0.1908
Board size	0.007456	0.00465	1.603673	0.1141
Bank age	0.001402	0.000862	1.626573	0.1092
Bank size	2.57E−12	1.23E−11	0.208402	0.8356
Bank type	0.004863	0.014201	0.342464	0.7332
Bank leverage	0.056965	0.045778	1.244358	0.2183
R^2	0.610875			
F-Statistic	0.000000			

* Significant at the 0.05 level

five bank-specific variables, explains about 61% of ROE variation ($R^2 = 0.610$). The F-statistic (< 0.05) confirms the overall significance of the regression model.

Table 4 displays the panel regression findings for Palestinian banks with return on assets (ROA) as the dependent variable. The model, featuring five diversities and five bank-specific variables, accounts for around 27% of ROA variation ($R^2 = 0.2669$). The F-statistic (< 0.05) affirms the overall significance of the regression model.

6 Testing Hypothesis and Results

6.1 Hypotheses Testing

H1: Gender diversity has a significant positive impact on the financial performance of the banks listed on Palestinian exchange.

The study reveals that Palestinian banks with more gender-diverse boards do not show higher return on equity (ROE) and return on assets (ROA) when compared to banks with less diverse boards. It is evident that banks with more gender diversity on their boards do not achieve superior ROE and ROA compared to those with less diversity. The researcher attributes this finding to the low percentage of female representation on bank boards. This outcome aligns with the findings of [51] who similarly concluded that gender diversity does not have a significant impact on financial performance.

Table 4 Regression results for Palestinian banks using ROA

Constant and variables	Coefficient	Std. error	t-statistic	Sig.
Constant	0.064388	0.027994	2.300076	0.0250
Gender diversity	− 0.022128	0.048772	− 0.4537	0.6517
Age diversity	− 0.000463	0.0013	− 0.35598	0.7231
Nationality diversity	− 0.053646	0.013794	− 3.88914	0.0003*
Education diversity	0.038358	0.016384	− 2.3412	0.0226*
Experience diversity	0.004562	0.001241	3.677502	0.0005*
Board size	0.001524	0.001767	0.86252	0.3919
Bank age	0.000516	0.000328	− 1.57379	0.1209
Bank size	5.26E−12	4.69E−12	1.121602	0.2666
Bank type	0.002925	0.005396	0.541988	0.5899
Bank leverage	− 0.051432	0.017394	− 2.95691	0.0045*
R^2	0.266900			
F-Statistic	0.034231			

* Significant at the 0.05 level

H_2: Age diversity has a significant positive impact on the financial performance of the banks listed on Palestinian exchange.

Palestinian banks exhibit greater age diversity on their boards, resulting in higher return on equity (ROE) compared to banks with less diverse boards. However, despite having more age-diverse boards, they do not achieve higher return on assets (ROA) compared to less diverse banks. The researcher attributes the positive impact of age diversity on ROE in Palestinian banks to the effective collaboration and brainstorming among older and younger board members. This observation is consistent with the findings of [32].

H_3: Nationality diversity has a significant positive impact on the financial performance of banks listed on Palestinian exchange.

Initially, Palestinian banks demonstrate greater diversity in terms of nationality on their boards, yet they do not achieve higher return on equity (ROE) when compared to banks with less diverse boards. Conversely, although they have more diverse boards in terms of nationality, they achieve lower return on assets (ROA) compared to less diverse banks. The researcher attributes this negative impact of nationality diversity on ROA in Palestinian banks to the inadequate communication and discussion among board members from different nationalities. This finding is supported by the results of [1, 52, 53].

H_4: Education diversity has a significant positive impact on the financial performance of banks listed on Palestinian exchange.

Palestinian banks that feature diverse educational backgrounds among their board members achieve a higher return on assets (ROA), although they do not exhibit a similar increase in return on equity (ROE) compared to banks with less diverse boards, aligning with the findings of [46]. However, studies conducted by Fares and

Nour [51], Abdelhaq et al. [52] did not identify a significant impact on financial performance from board education diversity.

H_5: Experience diversity has a significant positive impact on the financial performance of banks listed on Palestinian exchange.

Palestinian banks demonstrate increased diversity in board experience without experiencing a higher return on equity (ROE) when compared to less diverse boards. Nevertheless, they do achieve a higher return on assets (ROA) with more diverse boards in terms of experience compared to less diverse ones. The researcher credits the positive influence of experience diversity on banks' ROA in Palestine to the improved capacity of board members with diverse experiences to generate innovative ideas and solutions, in accordance with [54].

7 Conclusion

The preceding findings suggest certain commonalities regarding board characteristics and firm performance. Consistent with prior literature, these results support the idea that the makeup of board characteristics positively influences firm performance. The primary aim of this study is to examine the impact of board characteristics on the financial performance of banks listed on the PEX.

To achieve this objective, we utilized data from banks listed on the Palestinian exchange, specifically focusing on seven banks over the period from 2010 to 2019, with a total of 70 observations. The sample is restricted to banks only, and financial performance is measured solely using ROA and ROE.

Our findings reveal that the financial performance of Palestinian listed banks is not associated with gender diversity. However, this indicates that the presence of women on boards is not widespread in the country, despite robust initiatives under the Code of Corporate Governance in Palestine aimed at promoting gender equality in various sectors.

We observed a positive relationship between age, education, and experience characteristics with ROA, while their impact on ROE was not significant. Additionally, age diversity showed a positive impact on ROE but not on ROA.

Future studies could explore the influence of board characteristics, encompassing both executive and non-executive directors, on bank performance. This would contribute to enhancing the existing corporate governance literature. Furthermore, the study suggests investigating other non-financial sectors to gain a comprehensive understanding of board characteristics' impact on performance.

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Utilizing Artificial Intelligence Techniques to Strengthen Marketing Campaign Resilience: A Proposed Model



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Abstract We now live in the age of technology, where companies thrive to revolutionize their strategies and stay ahead of the competition. In the search for powerful data and insights, artificial intelligence (AI) marketing tools have emerged as a game-changing force in the world of market research. Using these tools, companies can now easily collect, analyse, and interpret data, providing them with competitive advantages. In this paper, we will present a proposed model in the world of artificial intelligence marketing tools that help us enhance marketing campaigns, explore its potential to transform market research, the benefits and challenges of its use, and its impact on the future of business, as artificial intelligence marketing tools can be considered advanced software applications that change the game. For businesses, when it comes to market research, these elements use machine learning algorithms to simplify and automate marketing tasks, such as examining customer data from various sources like social media, email, and customer interactions. The valuable insights generated by AI marketing tools can provide important information about customer behaviour, preferences, and trends and enable companies to make informed decisions and create personalized marketing strategies that connect with their audiences. By integrating AI tools into their operations, businesses can enhance their marketing efforts and stay ahead of the competition in today's fast-paced digital landscape.

Keywords Artificial intelligence · Marketing campaign · Resilience · Proposed model

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1 Introduction

Digital marketing campaigns are the ideal tool for firms to gain clients and establish leadership in this era of fast digital transformation and information technology [1]. Within this framework, AI is quickly becoming a game-changer in terms of technology, significantly enhancing the efficacy of digital marketing initiatives [2]. Understanding data intelligently and using sophisticated insights to extract meaningful insights is the power of artificial intelligence [3]. In this light, the paper delves into some novel uses of AI that might boost the efficiency of digital marketing initiatives.

Artificial intelligence (AI) marketing is quickly becoming a game-changer in the realm of cutting-edge advertising, completely altering the way we engage with consumers [4]. Digital marketing strategies can be made more effective with the help of artificial intelligence by utilizing machine learning techniques and big data analysis [5]. Companies may improve the personalization of marketing messages and the accuracy of audience identification with the help of AI because it precisely understands consumer behavior and preferences [6]. With this fresh strategy, we can enhance the customer experience and give ourselves a better shot at succeeding in this cutthroat industry [7].

Businesses are transforming their communication with target audiences and achieving results using AI-powered marketing [8]. The fast development of AI technology has provided marketers with effective methods and tools to improve their marketing efforts and provide large-scale tailored experiences to consumers [9]. Digital marketing is going through a revolution due to AI-powered chatbots that engage with consumers in real-time and predictive analytics that enhance advertising efforts [10].

2 Methods Involving Artificial Intelligence

Machines and programs that demonstrate intelligence in ways that resemble human mental capacities and ways of working are referred to as artificial intelligence (AI) [11]. AI can learn, infer, and respond to programmed situations in the same way that humans can. Additionally, it is the name of a subfield of computer science that focuses on developing AI-like computer systems and software. “The science and engineering of making intelligent machines. “ John McCarthy, who first used the term in 1955, and leading researchers agree that AI is “the study and design of intelligent systems that understand their environment and take actions that increase their chances of success. “ Recent years have seen tremendous progress in artificial intelligence research and development, with “deep learning” technology serving as its most visible expression [12]. The foundation of this field is the creation of artificial neural networks that can learn and grow autonomously, just like the human brain. These networks are designed to function similarly to how the human brain does its

job. However, there are several AI methods that can be utilized to support marketing activities like chatbot, predictive analysis, machine learning and others.

2.1 Chatbots

Across all digital platforms, chatbots are a great way to communicate with consumers, answer their questions, and help them with purchases and customer service [13]. In order to comprehend consumer questions and give helpful responses, chatbots use AI methods like machine learning and natural language processing. In a natural way, chatbots may converse with consumers, answer their questions, point them in the direction of relevant information, and even handle some basic issues [14]. The usage of chatbots in e-marketing has the potential to enhance both the user experience and the conversion rate [15]. Chatbots allow clients to self-serve by answering their queries and addressing their requirements without interacting with a human support representative. To further boost sales and consumer engagement, chatbots can use data analytics and previous purchases to suggest items and services [16]. In electronic marketing, chatbots often help with user experience, involvement, and engagement, which in turn lead to better results in recruiting and retaining clients [17].

One goal of using chatbots in e-marketing is to achieve highly targeted marketing is data analysis, where e-marketing makes use of AI to sift through mountains of information on prospective buyers, such as their tastes, buying habits, and online habits. In order to better target consumers with marketing campaigns, this data is analyzed to spot trends and patterns and to foresee what customers might require [18]. E-marketing AI sifts through consumer data, interests, and actions to come up with suggestions for goods and services that could pique their interest. When it comes to improving the personalized shopping experience and increasing the conversion rate, artificial intelligence (AI) can rely on machine learning techniques to identify and provide the most likely offers to clients [19]. Also, AI give quick response E-marketing chatbots and self-support systems powered by artificial intelligence allow for real-time handling of client inquiries and complaints. By analyzing past encounters and learning from them, AI can deliver accurate and individualized responses. This helps with meeting consumer needs and creating a happy experience [20].

Moreover, AI in e-marketing may scour existing data for ad-targetable trends and models. AI can optimize advertising tactics by predicting the possibility that customers would connect with specific ads [6]. Using the data and context provided by the target client, smart advertising enables the automatic generation of targeted ads. Ads can be more effective and reach their intended audiences with the help of AI, which can analyze data, generate personalized ads according to consumer interests and preferences, and assess the success of ads by tracking how customers engage with them. With the use of historical data, AI can figure out what people like and don't like and then suggest ways to make ads better in the future [21]. In addition, AI examines information about consumers, rivals, and the market. Using factors like

supply and demand as well as competitive pricing dynamics, AI can spot patterns and trends in the market and determine how to best price products and services [22].

Finally, AI can be utilized to predict prices and customer behavior. Prices can be adjusted in real time to reflect market fluctuations and new information. Production costs, supply and demand, and projections for the market all play a role in the ongoing process of price adjustments. Businesses can adjust prices based on market conditions in this way [23]. Moreover, AI can help with pricing testing to see how different amounts affect response and sales. Artificial intelligence can sift through trial data and offer advice on the optimum costs to get the best results. In the term of customer behavior, (AI) can look at past data and forecast how supply and demand will vary based on a number of factors; this helps with pricing in the future [24, 25].

2.2 Marketing Campaigns with AI

AI can analyze large amounts of data quickly, which helps firms save both time and money. In addition, AI systems are able to draw trustworthy conclusions about consumer habits, tastes, and tendencies by sifting through mountains of data. Moreover, it can enhance the client experience by creating personalized marketing strategies that are based on individual preferences [26].

The use of artificial intelligence (AI) in marketing is becoming increasingly common. It is rare to find companies, whether large or small, that do not use marketing tools based on artificial intelligence. Big companies like Google, IBM, and Airbnb are using AI marketing tools to gain a competitive advantage.

A large number of global companies have begun to rely on artificial intelligence technologies, despite warnings issued by a number of experts. For example, Mattel turned to the DALL-E image generator powered by artificial intelligence to come up with ideas for toy cars. CarMax, a used car company, also uses artificial intelligence techniques to survey customers. Moreover, Grocery delivery company Instacart has also turned to GPT chat technology to answer customer questions about food. In addition, Coca-Cola also plans to use generative AI to help create new marketing content. Although the company did not detail exactly how it plans to deploy the technology, the move reflects increasing pressure on companies to use tools that many of their employees and consumers are trying out for themselves.

2.3 Automated Systems Methods and Advertising Initiatives

The potential for AI-driven advertising campaigns is limitless, given the rapid advancements in AI technology. Marketers should take advantage of these new trends to boost marketing, customer experiences, and company growth. To keep up with the dynamic digital world, firms are embracing AI-powered marketing methods [27]. Nowadays, companies can't do without social media marketing to reach their

customers and sell their wares. The integration of AI into social media marketing has unleashed limitless potential, thanks to the lightning-fast development of AI technology. This paper will examine- by proposed model—the ways in which artificial intelligence is changing the face of social media marketing and will provide a few instances of its use based on several algorithms. Content suggestions algorithms powered by artificial intelligence may sift through user data including interests, preferences, and past web searches to deliver tailored content suggestions. Instagram and Facebook employ AI to personalize users' news feeds with material they are more likely to find interesting and relevant. For instance, the AI algorithm will give more weight to health and fitness-related material if the user regularly engages with postings about fitness [28, 29]. In addition, analysing sentiment algorithms powered by artificial intelligence can sift through the sentiments shared by social media users. By doing so, businesses can learn how the public perceives their name, goods, and services. A company's reputation, customer service, and ability to respond to bad evaluations can all be enhanced by keeping an eye on sentiment analysis. To better understand customer sentiment and act accordingly, AI may, for instance, analyse the language used to determine if a brand-related tweet is favourable or negative [30]. Moreover, marketing using influencers: by finding the most relevant influencers for brands and establishing connections with them, AI has greatly improved influencer marketing. Machine learning algorithms can sift through mountains of social media data in search of niche-specific influencers with substantial followings, active interaction, and solid credibility. In this way, companies may team up with influential people who already have a large following and can spread the word about their products and services to that demographic [31].

Personalizing and optimizing ads utilized algorithms comes to social media and targeting. A company's target audience's demographics, interests, and habits can be uncovered by analyzing user data using AI. Businesses can use this data to make advertisements that are more relevant to their customers' interests [32]. Such data can be analyzed to create appealing and effective marketing messages, AI programs can sift through mountains of consumer data. Systematically examining market movements and forecasting trends are two examples of how artificial intelligence (AI) can outperform humans in data analysis [33, 34].

3 Proposed Business Intelligence Model

Given previous literature, and launching from main aim of this paper, it was meant to examine how to utilize artificial intelligence Techniques to strengthen marketing campaign resilience; the following Fig. 1 showed the proposed model.

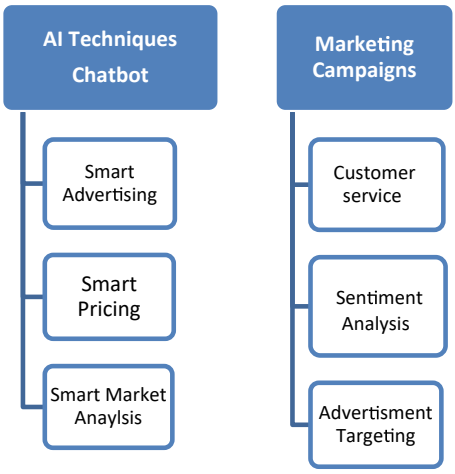


Fig. 1 The proposed model

4 Discussion

Marketing that relies on artificial intelligence is the one that uses artificial intelligence tools to automate management and operating processes and make decisions based on collecting information, analyzing data, in addition to continuous observation of common economic topics that can affect the results and effects of marketing. It also relies on user data to learn more about the best ways to communicate with them and provide them with personalized messages at the right time. Here we must ask: How has the emergence and advancement of artificial intelligence contributed to the development of digital marketing?

This requires creating a plan to apply the full benefit of AI technologies to advertising campaigns and marketing activities. The plan includes minimizing risks and challenges and achieving maximum return on investment.

Before using any AI tool, you should consider the following:

1. Setting goals: Is the goal to achieve speed in productivity, improve customer satisfaction, or automate tasks? So, determine your purpose of use.
2. What are your data standards: What limits will you set when collecting data, and how they might impact security, privacy, and data ownership, which are customers' biggest concerns?
3. The amount of data, its sources, and will it be done legally?

As a logical consequence of the above, it will become possible:

Providing high-quality customer experiences, by providing personalized recommendations for services and purchases based on their previous purchases and interests.

Generate artificial intelligence content and content titles, including all types of written, audio and visual content that do not have copyrights.

Create highly customized marketing campaigns to meet specific needs that differentiate repeat customers.

Using predictive analytics to determine customer behaviors based on purchase history, purchasing preferences, etc.

Optimize advertising campaigns and determine the most effective channels.

On the other side there are many risks resulting from using artificial intelligence tools to enhance marketing campaigns are:

1. Data accuracy

Data accuracy is a challenge for artificial intelligence (AI) in advertising. The data collected for modelling must represent all aspects of customers in order to create effective models for them. The data must be accurate and then there must be a way to verify its accuracy. However, incorrect data entry leads to wrong output by AI, which ultimately affects the advertising campaign and its success.

2. Data privacy

There is an AI threat to marketing fields and a growing concern about data privacy as artificial intelligence (AI) becomes more common in advertising, with the potential to create more personalized ads and can inadvertently collect sensitive information about consumers. This makes protecting consumer data difficult while allowing AI technology to perform better. There are different ways to mitigate these risks, but in the end, it depends on which companies can protect privacy while using AI.

3. Changes in customer behaviour

Customer behaviour is a challenge for AI in advertising. For example, customers today interact with ads more than ever before. They are also more dependent on their phones and computers and can access more information at any time. As brands try to target them with new and tempting offers, their loyalty is likely to falter. This means that AI must be able to understand and respond to customer behaviour to create successful ads.

4. Weak IT infrastructure

The use of artificial intelligence in advertising is increasing, and companies are looking to automate tasks and produce more engaging ads. However, poor IT infrastructure may make it difficult to use, as it can slow down data processing or lead to errors. This means that companies need to invest in good IT infrastructure if they want to use it in their marketing campaigns.

5. Lack of trust of (AI)

For artificial intelligence (AI) to be widely used in advertising, there must be a greater level of trust between AI systems and humans. Currently, the risk of AI to marketing areas in this lack of trust is a challenge that companies face when it comes to using it in advertising. There are several reasons for the lack of trust, including the fact that AI systems are not always accurate and can be biased.

In addition, well-known companies such as Google have been criticized for misusing user data, and Facebook has been accused of spreading false information. Now, with all this talk, it begs the question, how reliable is AI in advertising?

6. The danger of artificial intelligence on marketing areas: low investment

One of the main challenges of AI in advertising is the lack of investment in its software and services. Even if the AI market is thriving and very popular, continuous AI modelling and hiring skilled human resources or using AI consulting services can be expensive. This has led to a low rate of adoption by businesses, meaning some agencies and brands are still hesitant to use it for advertising.

However, companies like Albert, Google, Invoca, Amplify. AI, and Amplero are a few that are using AI to create powerful, engaging and relevant ad copy for their clients.

5 Conclusion

Insights generated by AI marketing tools provide valuable information about customer behavior, preferences, and trends, enabling businesses to make informed decisions and create targeted marketing strategies that resonate with their audiences. By harnessing the power of AI tools, companies can improve their marketing efforts, stay ahead of the competition, and build long-term customer relationships. As we know, artificial intelligence tools have pros and cons, and the benefits far outweigh the potential disadvantages. With their ability to analyze massive amounts of data quickly and accurately, businesses can save time and resources while gaining valuable insights into their target audience. All companies understand the importance of using the latest technologies to stay ahead in today's competitive market. That's why we offer a suggested model of artificial intelligence tools to help companies of all sizes improve their market research and enhance their marketing campaigns.

An example of the benefits of AI experience is that AI Customer Experience, which is the practice of using AI technology to provide an enhanced and intelligently considered user experience at every customer touchpoint. Some reports state that 80% of customers indicate that they are more likely to buy from brands that provide a personalized experience.

Artificial intelligence is an important factor in changing the rules of the customer experience game, and leading brands are adopting artificial intelligence technology as a seamless way to provide their users with a personalized experience.

In fact, one previous study showed that 63% of people who used artificial intelligence-based services or products, such as chatbots, did not realize that they were using artificial intelligence, and this number is likely to be higher nowadays with the development of artificial intelligence technology.

Artificial intelligence helps predict customer behaviors and needs, as predictive personalization is an artificial intelligence technology that can make customer experiences feel as if it was made just for them. Not long ago, companies relied on manual

data collection combined with forecasting to make important business decisions, and AI-powered insights improve the decision-making process, Therefore, the company's vision can become more data-driven now through artificial intelligence.

Successful companies have several channels of communication and enhance engagement with customers, such as the company's website, applications, social media channels, and the customer service platform, and artificial intelligence can work to seamlessly connect all of these channels to provide a multi-channel customer experience.

As for the marketing sector, it has become more targeted and effective, because artificial intelligence has become useful for understanding customer behavior, Artificial intelligence can easily perform the task of customer engagement, because it will help connect the customer to every touchpoint and inspire him to belong to the brand.

AI can also reduce the need for human intervention to solve customer service issues, streamlining positive customer experience processes.

Artificial intelligence greatly serves each component, as it helps with its ability to collect and analyse customer data in real time and obtain a better understanding of customer behavior and needs, in order to create a customized customer experience strategy.

Artificial intelligence also seeks to satisfy customers by analysing customer data and main criteria and recommending products or services to them, based on their browsing and purchasing preferences, in addition to the ability of artificial intelligence to analyse large data sets and then draw information such as weather and location and suggest relevant content to customers.

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The Impact of Savings on Economic Growth: A Case Study



Nidal Ali Abbas

Abstract From 1991 to 2021, a detailed investigation was undertaken to evaluate the factors underlying savings trends in Jordan. Utilizing a carefully developed standard model founded on time series methodology, the researcher sought to establish the intricate association between savings and its primary determinants. The choice of this analytical framework was deliberate, aimed at unraveling the link between savings patterns and the broader economic growth context. The main aim of this research initiative was to conduct a comprehensive analysis of savings patterns in Jordan, the researcher employed a meticulous standard model rooted in time series methodology to elucidate correlations between savings and key determinants. By utilizing a clever combination of unit root tests and the Johansen co-integration test, alongside the use of the Fully Modified Ordinary Least Squares (FMOLS) methodology, we can obtain a thorough comprehension of the contributing factors behind the decrease in living standards of Jordanian inhabitants. This research is primarily focused on understanding this decline within the framework of the economic downturn that was triggered by a significant decrease in the ability to save. Our end goal is to achieve a profound insight into this issue. The robustness of the relationship between savings and economic growth was investigated through a rigorous analytical analysis that aimed to examine the existence of co-integration among study variables. The multi-faceted analysis produced critical insights into the complicated dynamics governing the interplay between savings patterns and economic growth within the context of Jordan. The knowledge offered from these findings adds value to the discussion on economic fluctuations and living standards in the region.

Keywords Savings · Economic growth · Jordan · Co-integration

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1 Introduction

Amidst today's experts, there is a strong agreement that savings is a key factor driving economic growth in various nations. Though a collection of funds, savings represents the possibility of future spending, especially in times of financial hardship. This function extends beyond buffering financial instability, as savings can become a foundation for investments that support economic development and boost productivity in various important industries. The connection between savings and investments creates a holistic approach to development by transcending various economic aspects. For individual finances, investing savings triggers a ripple effect, increasing incomes and ultimately leading to national economic growth and improved well-being. At a macro level, this intricate interplay resonates in numerous ways [1]. Inflation poses a complex challenge to the economy, impacting employment rates and necessitating prolonged efforts for correction. However, investigating the diverse effects of savings reveals that it can act as a powerful remedy against economic disruptions caused by inflation. This highlights the vital role of savings in promoting amplified job opportunities and reducing unemployment rates. It is important to note that the repercussions of inflation are not fleeting, but can extend into prolonged periods, requiring prolonged corrective measures. Internal financing is crucially enhanced by an indispensable reservoir of savings that wields transformative influence in bolstering investment activity [2]. The crucial role of savings as a linchpin in steering the trajectory of economic development and vitality is underscored by the profound implications of this intricate interplay between savings and economic indicators that permeate through the economic fabric.

In this thorough study, we focus on the striking decrease in savings rates that have been observed across the world in connection with the intricate fabric of global economic and political factors. This notable dip, which has been aggravated by a palpable slump in economic development rates, has forced developing countries to depend on outside financial support, leading to an unstable economic situation [3]. It is important to note that Jordan has also experienced the same trend, despite intense government efforts to encourage savings and growth. This underscores the seriousness of the issue at hand, and the government's recognition of the key role of savings in economic activity [4].

Identifying the most important variables that influence savings rates is crucial for this study. The fluctuations of these variables are key to understanding economic growth rates and the acquisition of necessary funds. Internal sources of financing play a vital role in achieving this pivotal outcome. Therefore, pinpointing these variables is of heightened significance to the study. Dipping into a variety of vital economic factors such as inflation, labor, exports, and fixed capital, the examination strives to reveal the elaborate consequences of savings. As such, the study's scope expands well beyond the mechanics of savings alone, going so far as to fully explore the intricate connection between savings and a breadth of economic variables. In order to shed light on the complex interplay between economic factors and savings, a carefully-crafted model is employed on this exploratory journey. The ultimate goal

is to furnish experts with unique insights that can be used to provide wise counsel to decision-makers who seek to foster economic prosperity. The pressing need behind this mission stems from the crucial role that enhanced economic growth plays in navigating unpredictable economic terrain. Not limited to the context of this study, there is a significant emphasis on defining the concept of savings at a pivotal point in this journey. Given the diversity of perspectives within different economic schools of thought, it is crucial to take a foundational step by dissection of the definition of savings. This meticulous approach serves as a preamble to the all-encompassing exploration that will follow, highlighting the multifaceted nature of savings and its critical role in economic development. This step is absolutely essential due to the varying conceptual nuances related to savings which emanate from different sources [5].

A. **Classical School:**

At the crux of the approach advocated by Adam Smith and John Say lies an intriguing argument: savings serve as a key vehicle for future consumption, forsaking fleeting indulgences in immediate gratification. This perspective boasts a widened scope, taking into account diverse factors like inheritance, the gradual build-up of money and assets, and real-world possessions in the careful crafting and molding of savings. This nuanced paradigm moves beyond the mundane understanding of savings as a mere act of restraint from spotty spending, delving into a more encompassing perspective that acknowledges the multifaceted nature of savings.

B. **Neoclassical School:**

Intriguingly, the conceptualization at hand has its roots in the musings of Fisher [6], whose insightful analysis posited that the act of consumers refraining from purchasing a specific product does not merely result in a decrease in their capacity, rather it leads to an increase in their savings. According to Fisher, any given interest rate is acceptable to individuals, as it fosters savings intended for investment in fresh assets. The cornerstone of this economic equation is the interest rate, serving as the dynamic variable that manages a fragile balance between the total amount of savings and the overall expanse of total investment.

Alfred Marshall delves into the neoclassical perspective and adds an intricate dimension to the debate by identifying two significant factors that determine the amount of reserves wanted: the inherent importance of savings and wealth. Marshall's principles stipulate that the interest rate materializes as the natural expense linked with deploying capital in markets. An equilibrium comes about when the overall demand for capital is in sync with the complete supply of capital at a standard price [7]. To attain complete employment and fortify growth, neoclassical theory postulates that the crucial factor is savings. The intricate task of achieving these objectives requires careful consideration of saving formation and expansion. Neoclassical underpinnings assert that this vital element is the keystone in funding the lofty goals of full employment and sustained economic growth [7].

C. **Keynesian School:**

In the world of economics, the famed economist Keynes has an interesting view on savings. According to him, savings are what is left of income after all the expenses are covered. But this view is not just about income and expenses—there are two crucial factors that play a role in determining savings: personal income and the marginal propensity to consume. Essentially, the income we receive includes both consumption and savings. And since savings are just deferred consumption, the factors that impact consumption also impact savings, creating an unbreakable bond between the two economic concepts. Scrutinizing household savings and their determinants is of great importance in developing countries where access to local funds is crucial for necessary capital accumulation—thereby becoming a critical driver for economic growth and development. In Jordan's socio-economic context, savings are notably restricted, largely due to the relatively modest per capita income. According to statistical records, savings on average, as a percentage of Gross Domestic Product (GDP), remained at 12.38% within the timespan from 1980 to 2014. A survey recently conducted by the Central Bank of Jordan has revealed that savings levels have experienced a discernible decline, dwindling down to approximately 4.35% of GDP in 2022. This downward trajectory can be attributed to both the adverse impact of COVID-19 and a reduction in the financial capacities available for savings within households throughout Jordan [8]. On a related note, a World Bank report from 2017 made an interesting observation—that 45.2% of Jordanians possessed the ability to save money through various means. Jordan reveals a fascinating trend of domestic savings, comprising 10.6% of all savers in 2022, as the primary mode of financial preservation. This mosaic of data uncovers the multifaceted factors that shape Jordan's savings behavior and offers insight into the nuanced landscape of savings in the region.

2 Economic Literature and Previous Studies

It is crucial to recognize the essential role of savings in economic growth and development as it serves as a vital source of financing for numerous sectors. This, in turn, reflects the national economic activity and has a diverse impact on the employment rates which ultimately affects the Gross National Product (GNP). To gain insight into the influence of savings on economic growth, it is pertinent to examine key studies in this line of inquiry. One such study [8] scrutinized the determinants of household savings in Jordan over the span of 1980–2014. Significant effects on household savings were revealed by the study upon investigating variables with a long-term co-integrating relationship, with a correction rate of 65% for short-term deviations. Direct taxes and inflation had a negative impact on savings, while private consumption and deposits were positively and significantly affected by interest rates. The study also noted how cash holdings and worker remittances had no significant impact.

Egypt's economic growth is the subject of a study [5] on the effects of local savings. Conducted over the period of 1990–2017, the study shows that local savings have a

highly beneficial impact on both long-term and short-term economic growth. Meanwhile, Algeria is the focus of another study [9] examining the period from 1970–2016 and the economic factors at play when it comes to household savings. Identifying the determinants of household savings in Algeria, the study found that narrow money supply, direct taxes, private consumption, Gross Domestic Product (GDP), and inflation rate were all contributing factors. Narrow money supply was found to be the primary determinant of household savings, with a flexibility coefficient of 2.27. Direct taxes followed at a flexibility coefficient of 1.68. Private consumption had a flexibility coefficient of 0.88, GDP a coefficient of 0.73, and inflation rate had a coefficient of 0.45, making it the last determinant named.

Using Ordinary Least Squares (OLS) analysis on the economy of Palestine from 1995 to 2013 [10], researchers examined the savings situation and found that political instability led to changes in savings. Final consumption, international aid, and individual disposable income had a notable positive correlation with savings, whereas savings and investment, public debt, and unemployment rate had an inverse relationship.

During the timeframe of 1980 to 2018, a study [11] was undertaken in order to determine the elements which impacted the saving conduct of households in Saudi Arabia. The outcomes revealed that numerous variables had an effect on household savings, such as financial system development, interest rate on the real, real gross domestic income and wealth. Conversely, savings had an inverse correlation with inflation.

Using the life cycle hypothesis, a study [12] delved into the factors that influence private savings in India from 1954 to 1998. Curiously, the results divulged that disposable income and deposit interest rates have a positive correlation with savings. Conversely, exchange rates demonstrated an inverse relationship with private savings.

The study [13] analyzing savings and investing habits of households in Thailand revealed that the average savings rate equaled 29.17% of income. Most individuals saved with the intention of using their funds after retirement. Traditional saving methods such as real estate, bank deposits, and gold remained the most preferred options over financial asset investment.

Using data from the World Bank's World Savings Database spanning between 1961 and 1994, a study [14] examined the correlation between economic growth, investment rate, and savings rate. As per the findings, government savings were shown to negatively impact the overall savings rate in most of the regression models. On the other hand, the study found that labor quantity had a considerable positive effect.

For the years spanning between 1970 and 2007, a study [15] formulated a model representing the economy of Cameroon's savings function through utilization of the Johansen co-integration method. After analysis, it was discovered that stable political conditions and the availability of financial institutions and branches had a positive correlation with savings, as did the level of income. However, the real interest rate was found to hold little significance in regards to savings.

Using unit root tests and the Engle-Granger co-integration method, a study in Egypt [16] examined the influence of certain variables on overall savings during the

time frame (1975–2006). The results revealed that income growth rate contributed positively and significantly to both short-term and long-term savings, while interest rate effects were found to be positive and significant in the short term and not significant in the long term. Inflation rate effects also had a positive impact on savings in both short and long term. Both short and long-term savings were significantly positively affected by the ratio of money supply to GDP as a financial development measure, albeit insignificant in the former. Conversely, there were significant negative impacts on both timeframes due to the budget and current account deficits.

The Johansen co-integration method and error correction model were used in a study [17] to investigate the association between national savings and a variety of economic factors in Malaysia. The study found that the inflation rate, elderly dependency ratio and average individual income were the most significant variables affecting national savings. Interestingly, it revealed a significant negative correlation between income and national savings, and a positive relationship with interest rates. However, a negative relationship was observed between error correction rate, elderly dependency and national savings. Moreover, there was a significant and positive association between inflation and national savings.

3 Study Methodology

The years encompassed in this extensive study range from 1991 to 2021, with the investigator using a time series data analysis approach, and employing a set of standard tests to uncover the complexities that define the connection between economic growth and savings. Data integral to the empirical foundation of this research was sourced from reliable repositories, specifically the Central Bank of Jordan and the World Bank, and it was conscientiously attained. All of this establishes a strong groundwork for the ensuing analytical exploration. Within the scope of this study, an extensive range of variables were covered with meticulous attention to detail. These variables comprise of the Gross Domestic Product (GDP), inflation rate, exports, total capital formation, and a dynamic workforce. Collectively, they shape a comprehensive framework essential for exploring the intricate correlation between economic growth and savings in Jordan. An E-Views data package was employed to carry out a thorough analysis of the collected data, which provides a crucial compilation of economic indicators. The application of the Harrod-Domar model provided additional analytical depth in assessing the impact of savings on economic growth within Jordan's intricate economic landscape. Through scrutinizing this nuanced relationship, a theoretical lens was provided for interpreting the empirical findings derived from the comprehensive dataset under consideration. Thus, this multifaceted methodological approach allowed for a holistic understanding of the interplay between savings and economic growth in Jordan. The Harrod-Domar model illustrated this relationship as follows:

$$G = (\Delta Y/y) = (s/k)$$

This model serves as the basis for assessing the impact of savings on economic growth in Jordan during the specified time period.

$$\text{LGDP} = \Delta Y/y = f\ (\text{Lns},\ \text{LK},\ \text{Lx},\ \text{Linf},\ \text{Ll})$$

where:

GDP = Economic Growth, Lns = Gross Domestic Savings, Lk = Gross Capital savings, Lx = Export, Linf = Inflation Rate, Ll = Labor Force.

Based on the information provided, the researcher will conduct a series of standard tests to determine the nature of the relationship between savings and economic growth in Jordan, as follows:

1. Unit Root Test

It is crucial to ensure the stability and stationarity of time series data, whether at the level or in differences. This is particularly important when applying the Fully Modified Ordinary Least Squares (FMOLS) method, as it depends on this condition. By analyzing the variables in the study model, we can determine the degree of stationarity for the time series. Rejecting the null hypothesis of non-stationarity (Ho: $\delta = 0$) indicates that the time series has a unit root and is therefore considered stationary. Table 1 displays the unit root test outcomes. Unlike the null hypothesis [which affirms the existence of a unit root in the time series (H0: $\delta \geq 0$)], the alternative viewpoint proposes that the time sequence lacks a unit root (H1: $\delta < 0$).

Table 1 indicates that five variables out of six were stationary after the first difference with a constant intercept, while only one variable was stationary about the trend.

2. Johansen Co-integration Test

Using the Johansen methodology, the researcher conducted a co-integration test and discovered that the study variables are co-integrated. With this information, the researcher has decided to utilize the Fully Modified Ordinary Least Squares (FMOLS) approach.

The results of the co-integration analysis using the Johansen methodology can be displayed in Table 2.

Table 1 Unit root test

Variables	Levels	1st diff.
Variables	−0.5878	−1.8177*
Variables	−2.0636	−5.4285*
Variables	−1.5999	−4.0422*
Variables	−1.0966	−6.3748*
Variables	−1.1895	−5.0452*
Variables	−5.1543*	−6.9213*

* Differs from zero

Table 2 Johansen Co-integration test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.967307	192.7096	95.75366	0.0000
At most 1 *	0.877260	103.7743	69.81889	0.0000
At most 2 *	0.575433	49.23449	47.85613	0.0369
At most 3	0.522918	26.96064	29.79707	0.1026
At most 4	0.240853	7.718899	15.49471	0.4959
At most 5	0.021095	0.554330	3.841465	0.4566

Trace test indicates 3 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** MacKinnon-Haug-Michelis (1999) p-values

3. Modified Least Squares (FMOLS) estimation

Using the method of Fully Modified Ordinary Least Squares (FMOLS), the researcher assessed the effect of savings on economic growth. The study demonstrated that economic growth is influenced by savings at a rate of roughly (0.817056%). Therefore, a heightened savings rate of 1% equates to an augmented economic growth of around (0.817056%). During the study period, variables such as savings explained (0.463036%) of the fluctuations in Gross Domestic Product (GDP), as shown by the R-squared coefficient. The adjusted R-squared (0.346308) indicates that roughly (0.346308) of the GDP changes can be traced back to these factors. However, the remaining (65.5%) of GDP variance stands unaccounted for and warrants further research into external factors. This outcome aligns with the research conducted by Almutaim and Almokhzengi [5] on Egypt's case from 1990–2017, as well as Dhanya Jagadeesh's examination of Botswana. The test results are presented in Table 3.

Table 3 Fully modified ordinary least squares (FMOLS)

Variable	Coefficient	Std. error	t-Statistic	Prob
LOG(K)	0.106968	0.042384	2.523770	0.0190
LNL	0.020952	0.021947	0.954655	0.3497
LNINF	−0.250613	0.030010	−8.350865	0.0000
LNS	−0.817056	0.335710	−2.433817	0.0231
LOG(X)	0.162167	0.043065	3.765677	0.0010
C	0.277440	0.134679	2.060004	0.0509
R-squared	0.463039	Mean dependent var		0.077153
Adjusted R-squared	0.346308	S.D. dependent var		0.059928
S.E. of regression	0.048453	Sum squared resid		0.053996
Long-run variance	0.000577			

4 Results and Recommendations

The researcher, with meticulous precision and over a temporal span ranging from 1991 to 2021, endeavored to unearth the tangled web that connects savings and economic growth in Jordan. The researcher set out to investigate the notable decrease in savings rate within a particular socio-economic environment due to the observable downward trend in living standards, reduced spending power, and declining economic growth. To decipher the complex dynamics of this relationship, the investigator used a three-step methodology involving unit root tests, Johansen co-integration tests, and the advanced Fully Modified Ordinary Least Squares (FMOLS) technique. This research aims to unravel the underlying factors responsible for the decline in savings in this specific social context. Amidst a strategic deployment of a comprehensive analytical arsenal, the empirical foundations of the savings rate's decline were probed alongside the inherent relationships between savings patterns and prevailing economic growth trends in the considered temporal scope. Through methodical exploration, nuanced findings uncovered a compelling facet of the research that highlights the presence of co-integration among study variables. This revelation serves as a noteworthy testament to the entrenched and robust relationship between savings and economic growth, shedding light on the intricate interplay between these critical economic indicators in Jordan's specific socio-economic context.

The researcher advocates for a multifaceted approach to fortify and optimize the symbiotic relationship between savings and economic growth by strategically recommending the following:

1. Cultivate Savings Awareness:

Incentivize financial savings by establishing multiple campaigns targeting individuals from different income brackets, all while emphasizing higher income groups. Therefore, enable channels that effectively inform and encourage the practice of savings. These initiatives should raise awareness of the vital role savings play in personal finance.

2. Enhance Savings Efficiency:

Augmenting the efficiency of savings channels is a vital mission that can be accomplished through robust mechanisms. Providing facilitation is requisite by streamlining processes and implementing innovative approaches. The main aim is to ensure that saved funds are directed strategically towards avenues that bolster economic growth. A mechanism with such potential can propel savings into impactful ventures that contribute significantly to overall economic development.

3. Optimize Fiscal and Monetary Policies:

By pushing for the implementation of fiscal and monetary policies that specifically enhance savings returns, a strategic alignment can be achieved. This alignment can be achieved by carefully calibrating policies that not only promote saving but also foster an environment for maximizing returns on saved funds. Establishing a virtuous

cycle of sustained economic growth can be achieved by aligning economic policies with the ultimate goal of enhancing savings.

4. Diminish Reliance on External Financing:

Bolstering Jordan's economic self-sufficiency is the key to mitigating dependency on grants and loans for development financing. Jordan must proactively enhance its capability to generate internal funds through savings. If the economy can fund its own savings more efficiently, Jordan can lessen its external dependencies and maintain greater control over its economic destiny.

Envisioned to create a holistic framework, these recommendations advocate a synergistic approach to encourage savings at the individual level and strategically channel them towards initiatives that drive economic growth. The alignment of fiscal and monetary policies, optimized for savings returns, aims to establish an economic environment that empowers Jordan's economy to depend less on external financial sources. This promotes resilience and sustainability in the face of global economic dynamics. The ultimate objective is to establish a self-sufficient economy that can tap into internal financial reservoirs.

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The Impact of Digital Marketing on Customer Satisfaction in Tourism Companies: The Mediating Role of Perceived Value



Iyad A. A. Khanfar and Qusay Khalaf Muhammad Al-Khawaldeh

Abstract The objective of this study is to assess the influence of digital marketing tools on the satisfaction of customers in Jordanian tourism companies, while also considering the mediating role of perceived value from the customers' perspective. A descriptive analytical approach is employed, utilizing a questionnaire as the primary data collection instrument. The questionnaire is distributed to a sample of 500 customers, resulting in the retrieval of 408 valid questionnaires. This represents a response rate of 82%, which exceeds the minimum acceptable rate of 384. The questionnaire consists of 40 items designed to measure the variables and their respective dimensions. Statistical analysis is conducted using AMOS software version 22. The findings reveal a statistically significant positive impact of various digital marketing dimensions (including email marketing, influencer marketing, commercial advertising, and video marketing via YouTube) on the enhancement of customer satisfaction levels within Jordanian tourism companies. Collectively, these digital marketing dimensions account for 35.7% of the variance in customer satisfaction, with each dimension making distinct contributions: Email marketing explained 2.4%, influencer marketing 3.9%, commercial advertising 4.4%, and video marketing via YouTube 2.9%. Notably, video marketing via YouTube exhibits the highest explanatory power in relation to perceived value, contributing 34.2% towards the achievement of customer satisfaction. Based on the findings, it is recommended that tourism companies allocate more resources towards the creation of high-quality and captivating content, particularly in the realm of video marketing through platforms like YouTube. Emphasis should be placed on providing informative and engaging information that showcases the unique tourism experiences offered by Jordan. Additionally, it is advised to collaborate with influencers who possess a strong connection to Jordanian tourism and culture. Furthermore, email marketing strategies should

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be enhanced by improving the content of emails to make them more personalized. Customized deals that cater to the specific needs and preferences of customers should also be offered.

Keywords Digital marketing · Perceived value · Customer satisfaction · Tourism companies

1 Introduction

The examination of digital marketing tools enables an exploration of the benefits that can be derived from enhancing customer satisfaction. Numerous companies globally have dedicated teams to oversee their online operations, with some even establishing customer satisfaction departments that synergistically collaborate with other departments. The interdependence between customer satisfaction and digital marketing is evident, as the attainment of primary organizational objectives relies on the effective integration of both elements. Presently, companies are prioritizing customer-centric approaches by cultivating robust and authentic relationships.

The primary objective of companies is to ensure the satisfaction of both their customers and employees. In order to achieve this, astute companies prioritize the establishment of a heightened level of employee contentment. This, in turn, results in enhanced productivity, improved service and product quality, heightened customer satisfaction, increased customer retention, and ultimately, amplified business expansion and profitability. It has been observed that the quality of service and customer satisfaction exert a positive and substantial influence on customer loyalty, while the perceived price does not exhibit a positive and significant impact on customer loyalty [1].

The pursuit of stability, security, livelihood, and the acquisition of knowledge and cultural experiences has driven human beings to engage in tourism since ancient times. This multifaceted activity encompasses various aspects of life and serves as a crucial contributor to national income and the overall economic well-being of a country.

1.1 Problem Statement

The objective of this research is to examine the influence of digital marketing tools on customer satisfaction in the context of tourism companies. While digital marketing is recognized as a crucial factor in achieving customer satisfaction, its impact is often overlooked, resulting in a lack of clarity regarding customer needs and expectations. The complexity of digital marketing allows for multiple perspectives to be explored independently by marketers. However, there is a limited amount of literature that investigates the relationship between the five components of digital marketing (online

communities, interaction, content sharing, accessibility, and credibility) and their collective influence on user opinions, feedback, information, and ultimately customer satisfaction. Notably, no previous study has specifically examined this relationship within the tourism industry while considering the mediating role of perceived value. Therefore, this research aims to fill this gap in the literature [1–3].

From this, we can summarize the research problem that will be addressed in the main question as follows:

- What is the extent of the impact of digital marketing tools on customer satisfaction in tourism companies, which is measured in two dimensions: digital marketing and customer satisfaction?

1.2 Study Objectives

The primary objective of this study is to identify the impact of digital marketing on customer satisfaction and perceived value, while a set of sub-objectives are pursued in order to achieve this overarching goal.

1.3 Study Hypotheses

Based on the research problem and objectives, and drawing on relevant literature, the researchers propose the following hypotheses:

Main Hypotheses

- **HO1**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of digital marketing tools (email marketing, influencer marketing, commercial advertising, video marketing) on customer satisfaction in tourism companies."
- **HO2**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of digital marketing tools (email marketing, influencer marketing, commercial advertising, video marketing) on perceived value in Jordanian tourism companies."
- **HO3**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) on perceived value."
- **HO4**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of digital marketing tools in their combined dimensions (email marketing, influencer marketing, commercial advertising, video marketing) on customer satisfaction with perceived value as a mediating variable in Jordanian tourism companies."

The study attempts to verify the following sub-hypotheses:

- **HO1.1**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of email marketing on customer satisfaction in Jordanian tourism companies."
- **HO1.2**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of influencer marketing on customer satisfaction in Jordanian tourism companies."
- **HO1.3**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of commercial advertising on customer satisfaction in Jordanian tourism companies."
- **HO1.4**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of video marketing via YouTube on customer satisfaction in Jordanian tourism companies."

2 Previous Studies

The research conducted by [4] revealed that social media influencers possess certain attributes, such as fame, content quality, expertise, and credibility, that significantly impact the positioning of local tourism products in the minds of consumers. The result is a positive perception that allows products to speak for themselves—effectively fueling tourists' appetite for what these places have to offer. Ali [5] echo similar sentiments toward electronic advertising within the fast food industry. Indeed, it does not just influence consumer behavior positively but also steers it towards wiser purchasing choices, all while playing a pivotal part in unraveling the enigma that is consumerism. The impact of social media on consumer decision-making processes was unraveled by Belaichi [6], whereas Belaichi [6] brought into focus Facebook's role in putting tourism on the map. And as Al-Shammari [2] succinctly puts it, social media networks act as time-efficient information highways regarding customer tourism needs, slashing down time required for customer enlightenment.

3 Methods and Procedures

The aim of this section is to provide a complete description of the methodology used in the study, paying close attention to how the process was implemented. It details an elaborate explanation on how the population and sample were chosen including why specific criteria were used for data collection. Moreover, it paints a picture of what research instruments went into play, and what steps were taken to ensure they were reliable and valid through some serious test procedures. Such ones led us eventually towards certain objectives using various statistical tests. This chapter also took into consideration whether or not we had quality data that met assumptions required for hypothesis testing; if so, then we delved deep into unveiling our analytical toolkit along with strategies deployed during hypothesis testing.

3.1 Study Methodology

The present research takes a descriptive and analytical view of phenomena in their current state, particularly the factors surrounding them. The descriptive analytical approach is opted for to pave the way for an in-depth scrutiny and understanding of data. This serves as a boost to the credibility of our research as it helps us stay on course with our set objectives. The primary objective of this study is to investigate the impact of various digital marketing tools on customer satisfaction within Jordanian tourism companies. The study encompasses three independent variables, namely digital marketing (including email marketing, influencer marketing, commercial advertising, and video marketing via YouTube), a dependent variable (customer satisfaction), and a mediating variable (perceived value). To test the research hypotheses and analyze the collected data, the researcher employed appropriate statistical analysis methods.

3.2 Study Population and Sample

The study sample comprises individuals who are customers of tourism companies, encompassing a range of demographic attributes. Owing to the limited availability and confidential nature of data within the tourism industry, the researchers encountered difficulties in ascertaining the precise magnitude of the study population.

3.3 Study Sample

In accordance with Sekaran's [7] recommended guidelines for sample size, the study employed the largest representative sample size, which should not fall below 384 clients in order to ensure the representativeness of the sample. A total of 500 questionnaires were disseminated to clients of the company, yielding a response rate of 82% and resulting in 408 participants, surpassing the minimum requirement. To expedite the process and reach a greater number of targeted individuals with minimal time and effort, Google Forms was utilized to create and administer the questionnaires electronically (Table 1).

Table 1 The statistical standard for interpreting the arithmetic averages of study variables and determining their relative importance

Level	Range
Low	1–2.33
Medium	2.33–3.66
High	3.67–5

3.4 Reliability of the Study Tool

The consistency of performance or results obtained from the questionnaire when it is administered repeatedly to the same sample or variables pertains to its reliability. The purpose of assessing reliability is to ascertain the stability of measurement tools or questionnaires over time. Various statistical tools are employed to measure the reliability of a questionnaire, and this study utilized the internal consistency method.

3.5 Internal Consistency Reliability

Internal consistency pertains to the degree to which the individuals within the sample exhibit coherence and concurrence in their responses to the items presented in the questionnaire. The reliability of the questionnaire was assessed utilizing Cronbach's Alpha coefficient, which can assume values between 0 and 1. A Cronbach's Alpha coefficient of 0.7 or higher is indicative of satisfactory reliability [8]. The Cronbach's Alpha coefficients for the study variables and their respective items are displayed in Table 2.

Based on the data presented in Table 2, it is apparent that the Cronbach's alpha coefficients displayed a range of values between 0.729 and 0.863. Notably, all of these coefficients surpassed the minimum acceptable threshold for reliability, which is set at 0.7. Consequently, it can be inferred that the variables and their respective dimensions in the study demonstrate a strong internal consistency. This finding suggests that the questionnaire used in the study exhibits a high level of stability, thus providing assurance that the scale can be effectively employed and replicated to yield consistent results. It is noteworthy to mention that the overall reliability of the questionnaire was calculated to be 0.925.

Table 2 Cronbach's alpha coefficients for study dimensions

Dimension	Number of items	Cronbach's alpha
Email marketing	5	0.729
Influencer marketing	6	0.773
Electronic commercial advertising	6	0.805
Video marketing via YouTube	6	0.758
Perceived value	6	0.863
Customer satisfaction	11	0.828
Overall performance	40	0.925

3.6 Analysis of Data Suitability for Testing Study Hypotheses

The verification of data quality is of utmost importance in order to establish its appropriateness for hypothesis testing, a prerequisite for ensuring accurate outcomes when employing linear regression analysis. The evaluation of data suitability and quality involves the utilization of various statistical tests, such as assessments for normal distribution and multicollinearity.

4 Presentation of Results

4.1 Means and Standard Deviations of Study Variables

In order to evaluate the efficacy of digital marketing in Jordanian tourism companies and gain insights into the perceived value of their services and customer satisfaction, the researchers employed measures of central tendency and dispersion. The utilization of standard deviation as a measure of dispersion enabled the assessment of the level of consensus or divergence among the individuals sampled with regard to the various dimensions of the variables. Conversely, the arithmetic mean provided an indication of the magnitude of the variable dimensions and their practical implementation.

- **Email Marketing**

The dimension of email marketing was measured using five items. Table 3 displays the arithmetic means, standard deviations, and the relative importance of the items.

The range of these means varied from 3.35 to 4.10, indicating a combination of relatively high and medium importance. Among the items, the fifth one, which received the highest mean score of 4.10. This item also had a standard deviation of 0.914, suggesting its relatively high importance. On the other hand, the first item, which had the lowest mean score of 3.35 and a standard deviation of 1.213, indicating its relatively medium importance. Overall, the email marketing dimension demonstrated a relatively high level of importance, as evidenced by an overall mean score of 3.80. This suggests that email marketing is highly effective among Jordanian tourism companies.

- **Influential Marketing**

The influential marketing dimension was measured through six items, and Table 4 shows the arithmetic means, standard deviations, and the relative importance of the items.

Based on the data presented in Table 4, it is clear that the influencer marketing dimension has an average score of 3.66, indicating a medium level of relative importance. The items within this dimension are categorized as having medium to high

Table 3 Arithmetic means and standard deviations for email marketing dimension

Item	Ranking	Mean	Standard deviation	Relative importance
1. Email marketing stands out in presenting information about tourist attractions	5	3.35	1.213	Medium
2. Email marketing provides me with useful information about tourist attractions	3	3.96	0.989	High
3. Advertisements about tourist attractions in the Kingdom via email marketing are efficient	4	3.59	1.229	Medium
4. Email marketing provides me with information about tourist attractions in an easy language	2	4.02	1.006	High
5. Email marketing saves me time, effort, and money to access tourism information	1	4.10	0.914	High
Overall mean (email marketing)	–	3.80	–	High

Table 4 Means and standard deviations for influencer marketing dimension

Item	Order	Mean	Standard deviation	Relative importance
6. Provides useful information about tourist attractions	6	3.14	1.158	Medium
7. Provides me with visual experience about the nature of tourist attractions	2	4.00	0.991	High
8. Influencer marketing about tourist attractions on social media is efficient	3	3.64	0.848	Medium
9. Provides me with information about tourist attractions in an easy language	1	4.19	0.755	High
10. Saves me time, effort, and money to access tourism information	4	3.55	0.915	Medium
11. Provides me with exclusive news about domestic tourism	5	3.46	0.999	Medium
General average (influencer marketing)	–	3.66	–	Medium

relative importance. Among these items, Item 9 received the highest mean score of 4.19, with a standard deviation of 0.755, suggesting a high level of relative importance. On the other hand, Item 6 received the lowest mean score of 3.14, falling within the medium level of relative importance, along with a standard deviation of 0.858.

- **Electronic Commercial Advertisements**

Electronic commercial advertisements are one of the dimensions of the independent variable, which was also measured through six items. Table 5 shows the arithmetic means, standard deviations, and the relative importance of the items.

The findings presented in Table 5 reveal that the items pertaining to the electronic advertising dimension possess a significant level of importance. Among these items, Item 16 garnered the highest mean score of (4.02), accompanied by a standard deviation of (0.948). Conversely, Item 17 obtained the lowest mean score of (3.45), with a standard deviation of (1.182). On the whole, the electronic advertising dimension attained an impressive average score of (3.77), indicating a high level of effectiveness for Jordanian tourism companies.

- **Video Marketing through YouTube**

Table 5 Means and standard deviations for electronic advertising dimension

Item	Order	Mean	Standard deviation	Relative importance
12. Electronic ads stand out with an attractive style in presenting information about tourist attractions	3	3.99	0.964	High
13. Electronic ads provide me with useful information about tourist attractions	4	3.59	0.968	Medium
14. Electronic ads about tourist attractions are efficient	5	3.57	1.147	Medium
15. Electronic ads provide me with information about tourist attractions in an easy language	2	4.00	0.983	High
16. Electronic ads save me time, effort, and money to access tourism information	1	4.02	0.948	High
17. Electronic ads provide exclusive news about domestic tourism	6	3.45	1.182	Medium
General average (electronic advertising)	–	3.77	–	High

The dimension of video marketing through YouTube was measured through six items, and Table 6 shows the arithmetic means, standard deviations, and the relative importance of the items.

The data presented in Table 6 demonstrates that Jordanian tourism companies highly value the effectiveness of video marketing on YouTube. The mean scores for the sample ranged from 4.31 to 3.96, indicating a significant level of importance. Item 18 received the highest mean score of 4.31, while Item 23 had the lowest mean score of 3.96, both indicating a high level of importance. In general, the average mean score for the dimension of video marketing on YouTube was 4.12, suggesting a high level of effectiveness for this aspect among the companies surveyed.

The data presented in Table 7 clearly indicates that the dimensions of the digital marketing variable are predominantly of significant importance, with the exception of YouTube video marketing, which is classified as having a moderate level of importance based on its relatively lower mean score of 3.66. This implies that among the various digital marketing methods employed by Jordanian tourism companies, YouTube video marketing demonstrates the least effectiveness. Conversely, it is worth noting that YouTube video marketing obtains the highest mean score of 4.12, signifying the highest level of effectiveness among the digital marketing methods

Table 6 Means and standard deviations for video marketing through YouTube dimension

Item	Order	Mean	Standard deviation	Relative importance
18. Video marketing stands out with an attractive style in presenting information about tourist attractions	1	4.31	0.750	High
19. Video marketing provides me with useful information about tourist attractions	2	4.24	0.747	High
20. Video marketing about tourist attractions on social media sites is efficient	4	4.06	0.929	High
21. Video marketing provides me with information about tourist attractions in an easy language	3	4.07	0.973	High
22. Video marketing saves me time, effort, and money to access tourism information	5	4.00	0.971	High
23. Video marketing offers exclusive news about domestic tourism	6	3.96	0.933	High
General average (video marketing through YouTube)	–	4.12	–	High

Table 7 Mean scores for digital marketing variables

Dimension	Order	Mean score	Relative importance
Email marketing	2	3.80	High
Influencer marketing	4	3.66	Medium
Electronic advertising	3	3.77	High
YouTube video marketing	1	4.12	High
Digital marketing overall	–	3.84	High

utilized by these companies. In general, the efficacy of digital marketing tools for tourism companies in Jordan is considerably high, as evidenced by the mean score of the independent variable (3.84), which falls within the category of high relative significance.

4.2 Mediating Variable: Level of Perceived Value

The perceived value variable was measured through six items, and Table 8 shows the arithmetic means, standard deviations, and the relative importance of the items.

The perceived value variable displayed a range of mean scores between 3.30 and 3.99, indicating high and medium levels of importance. Among the items, item 24, which achieved the highest mean score of 3.99, accompanied by a standard deviation of 0.975. Conversely, item 27 obtained the lowest mean score of 3.30, placing it within the medium level, with a standard deviation of 1.285. Overall, the perceived value variable demonstrated a high level of significance, as evidenced by its mean score of 3.67, indicating a high perception of value among customers of tourism companies.

4.3 Dependent Variable: Customer Satisfaction Level

The customer satisfaction variable was measured through eleven items, and Table 9 shows the arithmetic means, standard deviations, and the relative importance of the items.

The level of importance attributed to customer satisfaction within tourist companies appears to vary between high and medium. This is evident from the arithmetic means calculated for different paragraphs, which range from 3.47 to 3.71. Notably, item 40 achieved the highest mean score of 3.71. Conversely, paragraph 36 obtained the lowest mean score of 3.47. On the whole, the variable of customer satisfaction attains a medium level of significance, as indicated by an overall arithmetic mean of 3.58. This implies that the level of customer satisfaction at tourist companies can be characterized as average.

Table 8 Mean scores for perceived value variable

Item	Order	Mean score	Standard deviation	Importance level
24. Jordanian tourism company provides added value through apartment offers	1	3.99	0.975	High
25. Quality of services offered by Jordanian tourism companies on digital marketing platforms is satisfactory	2	3.93	1.006	High
26. Cost of services provided by Jordanian tourism companies is satisfactory	3	3.86	1.109	High
27. Service prices in Jordanian tourism companies are commensurate with low-cost market value	6	3.30	1.285	Medium
28. Intend to recommend friends or family to services provided by Jordanian tourism companies	5	3.44	1.264	Medium
29. Jordanian tourism company offers diversity in various tourism programs	4	3.52	1.317	Medium
Perceived value overall	–	3.67	–	High

5 Testing the Study Hypotheses

The study was built on a set of hypotheses, and the researcher relied on testing Structural Equation Modeling, which was tested at a significance level ($\alpha \leq 0.05$). The following is an explanation of the results of hypothesis testing.

5.1 Testing the Main Hypothesis

HO1: There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of digital marketing channels (email marketing, influencer marketing, display advertising, video marketing) on customer satisfaction in tourism companies. Table 10 illustrates the results.

Based on the data presented in Table 10, it is evident that there exists a robust inverse correlation between the various dimensions of the independent variable

Table 9 Arithmetic means, standard deviations, and relative importance levels of customer satisfaction variable

Paragraph	Rank	Arithmetic mean	Standard deviation	Importance level
30. Digital marketing methods attract me towards dealing with tourism companies	6	3.57	1.254	Medium
31. I am attracted by the responsiveness and cooperation of the employees in tourism companies	5	3.59	1.193	Medium
32. The staff of tourism companies deal with me in solving the problems I encounter in tourism	10	3.50	1.254	Medium
33. The staff of tourism companies treat me kindly	4	3.61	1.231	Medium
34. You feel satisfied after using the services of Jordanian tourism companies	8	3.52	1.183	Medium
35. The staff of tourism companies listen to me and speak in an understandable manner	3	3.69	1.194	High
36. The information published through digital marketing drives me to repeatedly deal with tourism companies	11	3.47	1.214	Medium
37. The employees in tourism companies provide service with high efficiency	2	3.70	1.194	High
38. I recommend my friends to deal with tourism companies through digital marketing channels	7	3.53	1.175	Medium
39. Tourism companies have the ability to solve problems through digital marketing channels	9	3.51	1.264	Medium

(continued)

Table 9 (continued)

Paragraph	Rank	Arithmetic mean	Standard deviation	Importance level
40. The response from tourism companies through digital marketing channels is considered satisfactory	1	3.71	1.203	High
Customer satisfaction		3.58		Medium

(namely, email marketing, influencer marketing, electronic display advertising, and video marketing) and the dependent variable, customer satisfaction. This correlation is quantified by a correlation coefficient of $R = 0.598$. Consequently, it can be inferred that there is a positive association between the dimensions of digital marketing and customer satisfaction. Furthermore, this association is characterized by its strength and inverse nature, implying that an augmentation in these dimensions corresponds to an increase in customer satisfaction.

The value of the coefficient of determination (R^2) was found to be 0.357, indicating that the dimensions of the independent variable account for 35.7% of the variability in customer satisfaction. The remaining percentage of variance is attributed to factors that were not examined in this study. Furthermore, when comparing the tabulated F value (2.61) with the calculated analysis of variance for the F-test (56.290), it is evident that the calculated value significantly exceeds the tabulated value. This confirms the statistical significance of the regression model. As a result, the null hypothesis can be rejected, and the alternative hypothesis, which states that there is no statistically significant impact of digital marketing channels on customer satisfaction in tourism companies, can be accepted.

First Subsidiary Hypothesis Test

- HO1.1: There is no statistically significant effect of email marketing on customer satisfaction in Jordanian tourism companies.

Based on the findings presented in Table 10, there exists an inverse correlation between email marketing and customer satisfaction, as evidenced by a Beta value of 0.156. It is worth noting that this Beta value is the lowest among all the dimensions of digital marketing. The coefficient of determination (R^2) value, which measures the proportion of variance in customer satisfaction explained by email marketing, was calculated to be 0.024. This indicates that email marketing accounts for only 2.4% of the variation in customer satisfaction, while the majority of the variation can be attributed to other factors that were not examined in this study. The computed critical ratio (C.R.) value was determined to be 3.131, surpassing the tabulated value of 1.96. This suggests the statistical significance of the regression model used. Furthermore, the significance level for the test was found to be 0.002, which is lower than the predetermined threshold of 0.05. This confirms that the observed relationship between email marketing and customer satisfaction is not due to random chance.

Table 10 Results of testing the main hypothesis

Model summary		ANOVA			Dimensions of the independent variable	Unstandardized coefficients	Standardized coefficients	Regression weight	
Correlation coefficient R	The coefficient of determination R^2	F value	Degree of freedom	*P* value		B value	Beta value	C.R. value	*P* Value
0.598	0.357	56.290	4	0.000	Email marketing	0.154	0.156	3.131	0.002
					Influencer marketing	0.237	0.198	3.309	0.000
			403		Electronic Display advertising	0.208	0.209	3.865	0.000
			407		YouTube video marketing	0.196	0.159	2.805	0.005

The findings derived from the analysis of data lead us to reject the null hypothesis and accept the alternative hypothesis, thereby indicating a statistically significant impact of email marketing on customer satisfaction within Jordanian tourism companies. Moreover, the results demonstrate that a marginal increase in email marketing corresponds to 0.154 increase in customer satisfaction.

Second Subsidiary Hypothesis Test

- HO1.2: There is no statistically significant effect of influencer marketing on customer satisfaction in Jordanian tourism companies.

According to the data presented in Table 10, the correlation coefficient (Beta) between the independent variable, influencer marketing, and the dependent variable, customer satisfaction, was calculated to be 0.198. This positive value suggests an inverse relationship between the two variables, indicating that an increase in influencer marketing is associated with an increase in customer satisfaction. Additionally, the coefficient of determination (R2) was found to be 0.039, indicating that influencer marketing accounts for approximately 3.9% of the variability in customer satisfaction, while the remaining variance is attributed to other factors that were not examined in this study. Furthermore, the computed critical ratio (C.R.) value was determined to be 3.309, which exceeds the tabulated value of 1.96, thus confirming the statistical significance of the regression model.

Consequently, the null hypothesis is negated and the alternative hypothesis is embraced, signifying a statistically meaningful impact of influencer marketing on customer satisfaction. Furthermore, the findings illustrate that for every unit escalation in influencer marketing, there is a corresponding 0.237 elevation in customer satisfaction.

Third Subsidiary Hypothesis Test

- HO1.3: There is no statistically significant effect of electronic display advertising on customer satisfaction in Jordanian tourism companies.

The findings presented in Table 10 reveal a Beta coefficient of 0.209, indicating a positive inverse association between electronic display advertising and customer satisfaction. The coefficient of determination (R^2) was calculated as 0.044, suggesting that electronic display advertising accounts for 4.4% of the variability in customer satisfaction, while the remaining variance is attributable to unexplored factors. The computed critical ratio (C.R.) was determined to be 3.865, surpassing the tabulated value of 1.96, thus confirming the statistical significance of the regression model.

Drawing upon the findings, we refute the null hypothesis and embrace the alternative hypothesis, thereby implying a statistically substantial impact of electronic display advertising on customer satisfaction. Additionally, the outcomes reveal that a mere increment of one unit in electronic display advertising results in a corresponding augmentation of 0.208 in customer satisfaction.

Forth Subsidiary Hypothesis Test

- HO1.4: There is no statistically significant effect of video marketing through YouTube on customer satisfaction in Jordanian tourism companies.

The findings presented in Table 10 reveal a Beta coefficient of 0.159, indicating a positive inverse association between video marketing on YouTube and customer satisfaction. Furthermore, the coefficient of determination (R^2) value of 0.029 signifies that video marketing on YouTube accounts for 2.9% of the variability in customer satisfaction, while the remaining variance is ascribed to unexplored factors. Additionally, the computed critical ratio (C.R.) value of 2.805 surpasses the tabulated value of 1.96, providing confirmation of the regression model's statistical significance.

Consequently, the null hypothesis is discarded in favor of the alternative, signifying a statistically substantial impact of YouTube video marketing on customer satisfaction. Furthermore, the findings reveal that a rise of one unit in YouTube video marketing corresponds to a 0.196 augmentation in customer satisfaction.

5.2 Testing the Second Main Hypothesis

HO2: There is no statistically significant effect (at the 0.05 level) of digital marketing channels (email marketing, influencer marketing, electronic display advertising, video marketing) on perceived value in Jordanian tourism companies. Table 11 illustrates the results.

The correlation coefficient, denoted by R, demonstrates a robust negative correlation between the various dimensions of the independent variable, namely email marketing, influencer marketing, electronic display advertising, and video marketing, and the mediating variable of perceived value. Additionally, the Beta coefficient substantiates that these dimensions possess the ability to account for a substantial proportion of the variability observed in perceived value.

The proportion of variance in perceived value accounted for by the dimensions of the independent variable, as indicated by the coefficient of determination (R^2), is approximately 33.8%. This suggests that these dimensions have the ability to explain a significant portion of the perceived value. The comparison between the computed value of F and the tabulated value confirms the statistical significance of the regression model, with the computed value being significantly higher. As a result, the alternative hypothesis was accepted and the second main hypothesis was rejected.

The statistical analysis revealed that the dimensions of digital marketing, specifically electronic display advertising and video marketing via YouTube, exhibited a noteworthy level of statistical significance in relation to perceived value. Conversely, the other dimensions of digital marketing, namely email marketing and influencer marketing, did not demonstrate a statistically significant impact. These findings suggest that the utilization of multiple digital marketing channels can have a considerable influence on the perceived value of customers patronizing Jordanian tourism companies, particularly through the implementation of video marketing via YouTube and electronic display advertising.

Table 11 Results of testing the second main hypothesis

Model summary		ANOVA			Dimensions of the independent variable	Unstandardized coefficients	Standardized coefficients	Regression weight	
Correlation coefficient R	The coefficient of determination R^2	F value	Degree of freedom	*P* value		B value	Beta value	C.R. value	*P* value
0.581	0.338	51.395	4	0.000	Email marketing	0.057	0.059	1.174	0.240
					Influencer marketing	0.103	0.089	1.470	0.142
			403		Electronic display advertising	0.208	0.215	3.929	0.000
			407		YouTube video marketing	0.377	0.317	5.494	0.000

Table 12 Results of testing the third main hypothesis

Mediating variable	Model summary		Unstandardized coefficients	Standardized coefficients	Regression weight	
	Correlation coefficient R	The coefficient of determination R^2	B value	Beta value	C.R. value	*P* value
Perceived value	0.585	0.342	0.605	0.585	14.538	0.000

5.3 Testing the Third Main Hypothesis

HO3: There is no statistically significant effect at the ($0.05 \geq \alpha$) level of the perceived value on customer satisfaction in Jordanian tourism companies. Table 12 illustrates the results.

The findings presented in Table 12 demonstrate a robust and positive association between perceived value and customer satisfaction, as indicated by a correlation coefficient of $R = 0.585$. This further supports the statistically significant impact of digital marketing on enhancing customer satisfaction. Moreover, the determination coefficient (R2) of 0.342 reveals that perceived value accounts for 34.2% of the variability in customer satisfaction, while the remaining portion can be attributed to unexplored factors.

The critical ratio (C.R.) has been computed to be 14.538, which is considerably greater than the tabulated value of 1.96. This stark difference unequivocally confirms the statistical significance of the regression model. Furthermore, the test's significance level is calculated to be 0.000, which is lower than the standard threshold of 0.05. As a result, we reject the null hypothesis and accept the alternative hypothesis, indicating a statistically significant impact of perceived value on customer satisfaction.

The findings additionally demonstrate that the B value, with a magnitude of 0.605, signifies that a marginal augmentation in perceived value corresponds to a 0.605 increment in customer satisfaction within the context of Jordanian tourism enterprises.

5.4 Testing the Fourth Main Hypothesis

H04: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) of digital marketing channels in their entirety (email marketing, influencer marketing, display advertising, video marketing through YouTube) on customer satisfaction with perceived value being a mediating variable in Jordanian tourism companies.

Table 13 illustrates the coefficients of each path in the model, the standard error, critical ratio, and the statistical significance values.

Table 13 Coefficients in the path model, standard error, critical ratio, and statistical significance values

Path	Coefficient	Standard error	Critical ratio	Statistical significance
Digital marketing → perceived Value	0.970	0.095	10.160	0.000
Digital marketing → customer satisfaction	0.776	0.132	5.871	0.000
Perceived value → customer satisfaction	0.230	0.084	2.546	0.002

The findings presented in Table 13 demonstrate a statistically significant impact of digital marketing on perceived value and customer satisfaction. The coefficients for perceived value and customer satisfaction are (0.970) and (0.776) respectively, both of which are highly significant at a level of (0.000), indicating a strong relationship. Furthermore, the critical ratio values for perceived value and customer satisfaction are (10.160) and (5.871) respectively, surpassing the critical values.

In addition, the presented table provides evidence of a notable and statistically significant impact of perceived value on customer satisfaction, as indicated by a coefficient of (0.230), a significance level of (0.002), and a critical ratio of (2.546), surpassing the critical thresholds. To further investigate the role of perceived value as a mediator between digital marketing and customer satisfaction, the model was analyzed to assess both the direct and indirect effects. Specific details regarding these effects can be found in Table 13.

The coefficients of the direct and indirect path model, mediated by perceived value, are presented in Table 14.

The statistical analysis conducted in Table 14 reveals that both the direct and indirect paths of influence demonstrate significant results at a significance level of (0.05). The obtained findings are as follows:

The impact of digital marketing on perceived value is evident, as indicated by a coefficient of (0.725). Similarly, digital marketing has a direct influence on customer satisfaction, with a coefficient of (0.604). Furthermore, the findings reveal that perceived value has a direct effect on customer satisfaction, with a coefficient of (0.136).

Table 14 The coefficients of the direct and indirect path model through the mediation of perceived value

Variables	Nature of effect	Perceived value	Customer satisfaction
Digital marketing	Direct	0.725	0.604
	Indirect	0.000	0.662
Perceived value	Direct	0.000	0.136
	Indirect	0.000	0.000
Total effect		0.725	1.262

In terms of the indirect impact, the only route identified is the influence of digital marketing on customer satisfaction through perceived value. The coefficient for this path is 0.662, which is higher than the direct effect of digital marketing on customer satisfaction (0.604). The results of the path analysis lead to the rejection of the null hypothesis (Ho4) and the acceptance of the alternative hypothesis, which suggests a statistically significant effect of digital marketing channels (email, influencer, display, and video marketing) on customer satisfaction in Jordanian tourism companies, with perceived value serving as a mediating variable. This effect is significant at a significance level of $\alpha \leq 0.05$.

5.5 Recommendations

- Invest in engaging content, especially YouTube videos, focusing on useful and interactive information that reflects unique tourism experiences in Jordan.
- Collaborate with influencers in Jordanian tourism and culture to increase credibility and appeal, carefully selecting influencers to cater to an audience interested in Jordan's travel and heritage.
- Improve your email content by making it more personalized and delivering offers tailored to your customers' needs and preferences.
- Implement digital advertising strategies to reach a wider audience, promote travel offers and increase customer satisfaction.
- Use data analytics to understand customer behavior and preferences, helping you tailor your marketing campaigns and improve the customer experience to increase satisfaction and perceived value.
- Create interactive content such as contests, games and surveys to increase interaction and engagement with your brand, increasing customer satisfaction and encouraging them to share their experiences.
- It is important to regularly measure and analyze the effectiveness of your digital marketing campaigns to understand what worked and what needs improvement.

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The Relationship Between Internal Marketing Elements and Customer Satisfaction in Islamic Banks: The International Arab Islamic Bank as a Case Study



Zakaria Azzam and Sameer Alissa

Abstract This research sought to illustrate the link between the internal marketing aspects of the service provider and customer contentment in Islamic banking institutions. The variables involved in this study encompassed selection, training and development, motivation, delegation of authority, internal communication, and customer satisfaction. The choice to employ a descriptive-analytical method was based on its appropriateness for the study's nature. Two questionnaires were crafted as data collection instruments; one for employees and another for customers. The sample population was drawn from five branches of the International Arab Islamic Bank located in Zarqa city, (44) employee questionnaires were distributed with (33) deemed valid for analysis, while (450) customer questionnaires were sent out with (391) considered valid for analysis. The researchers applied suitable statistical techniques using the SPSS software to draw meaningful insights from the collected data. The findings point to a statistically significant correlation between all internal marketing components and customer satisfaction at the International Arab Islamic Bank in Zarqa. Among the variables, it was interesting to note that training and development garnered the highest importance from the employees' viewpoint, whereas delegation of authority was ranked fifth and least important according to them. On a positive note, customers showed satisfaction towards the services offered by the bank's branches. The study put forth several recommendations based on these findings:

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enhancing employee authority within the bank, removing unnecessary task performance restrictions for employees, urging management to revamp the incentive system with a more equitable distribution of financial rewards. Additionally, it stressed upon developing strategies aimed at bolstering marketing dimensions of the bank; this includes allocating a substantial budget as well.

Keywords Internal marketing · Customer satisfaction · Islamic Banks · Jordan

1 Introduction

Marketing of banking services is one of the hottest issues for researchers and professionals who are interested in the field of banking service marketing. This is largely due to the challenges hampering this area. These include, among others, information revolution and technological advancements in communication, competition, and evolving customer needs and wants. In order to address these challenges effectively, banks should begin their strategies from an internal standpoint. This involves creating a conducive environment within the organization, focusing on elevating the standards and quality of services provided by the bank (which falls under the responsibility of the service provider). The ultimate aim would be to attain customer satisfaction as well as a competitive edge in the market: two significant outcomes determined by actions taken within this external environment.

The practice of internal marketing stands as one of the foremost practices used by banks to better the quality of their services. This also satisfies the customers and comes highly recommended. The practice is that by satisfying service providers, it would lead to customer satisfaction [30]. This includes various elements such as ensuring selection of competent qualified service providers capable of delivering excellent service to customers, training and development, and retaining outstanding personnel with effective motivation techniques. Information for marketing banking services is included and so are interactive communication skills among employees. Suitable work environment at all levels within the bank's administration should be ensured too since it can play a significant role in achieving job satisfaction internally as well as satisfying external customers [8–11, 19, 20, 23, 27,].

The primary objective of this research is to delve into the connection that exists between the notion of internal marketing and customer contentment within Islamic banking establishments by means of the elements of internal marketing tailored for the service provider. These elements include selection, training and development, motivation, delegation of authority, and internal communications for the service provider. We seek to grasp how these individual components relate to customer satisfaction in the realm of Islamic banks.

1.1 Research Problem and Questions

The growth of the banking sector has reached an unprecedented level, making competition very tough between Islamic banks and then with traditional banks on the other hand. Both are striving to attain customer satisfaction through the delivery of quality banking services at par. As noted by [19, 20], this pressure has led banks to adopt marketing policies that will ensure excellence in service provision. One area that banks focus on as part of their marketing strategies is the internal marketing components. These components address the needs of service providers within the bank. They aim at achieving a high level of service quality that will lead to customer satisfaction. Unfortunately, there are times when these banks do not have sufficient awareness on how important internal marketing is towards customer satisfaction. This lack of understanding poses a real problem for them. Such a thing constitutes an inability to deliver effective services despite efforts made by staff members who are not properly motivated due to this reason. Internal marketing elements are said to have a major role in customer satisfaction according to [11, 29], and the failure of satisfying bank employees will result into negative impact on their performance plus quality of banking service, which then leads to customer dissatisfaction.

Based on the above, the research problem can be formulated with the following questions:

- Do Islamic banks in Jordan adhere to the application of the internal marketing concept?

1.2 Research Hypotheses

Based on the research problem and objectives, the following hypotheses are formulated:

- H01: "There is no statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the selection of the service provider and customer satisfaction in Islamic banks in Jordan."
- H02: "There is no statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the training and development of the service provider and customer satisfaction in Islamic banks in Jordan."
- H03: "There is no statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the motivation of the service provider and customer satisfaction in Islamic banks in Jordan."
- H04: "There is no statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the delegation of authority of the service provider and customer satisfaction in Islamic banks in Jordan."
- H05: "There is no statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the internal communications of the service provider and customer satisfaction in Islamic banks in Jordan."

1.3 Study Model

The development of the study model was influenced by the study variables and related works. These include: [1– 3, 5–7, 9, 12–18, 21, 22, 24, 26, 27, 29].

The study model can be illustrated in the following Fig. 1 [8].

2 Theatrical Framework

- **Internal Marketing**: It involves an array of functions carried out by the organization. This is to meet the needs and wants of the workforce, that is seen as internal customers, while also catering to the demands of external customers. The tasks that fall under this include selection, training and development, motivation as well as delegation of authority and internal communications, among others.
- **Banking Service**: It is a collection of actions and procedures, consisting of utilitarian value, that are embedded in both tangible and intangible aspects offered by the bank. These are perceived by the recipients based on the features and practical worth, which later act as a source to fulfill their present and future financial prerequisites while also serving as a credit requirement [30, 10]. At the same time, it acts as a profit generation for the bank due to this symbiotic relationship between both ends.
- **Banking Service Provider**: People in the bank who deal with customers directly and indirectly and are accountable for providing top-notch service quality as well as ensuring that customer transactions are done without delay [11].
- **Selection of Service Provider**: The procedure of choosing individuals with the appropriate skills to carry out specific job responsibilities efficiently [16].
- **Training and Development of Service Provider**: Strategies employed to polish, uplift, and take the current capacities and talents of the chosen person to a whole new level according to what is needed [25].

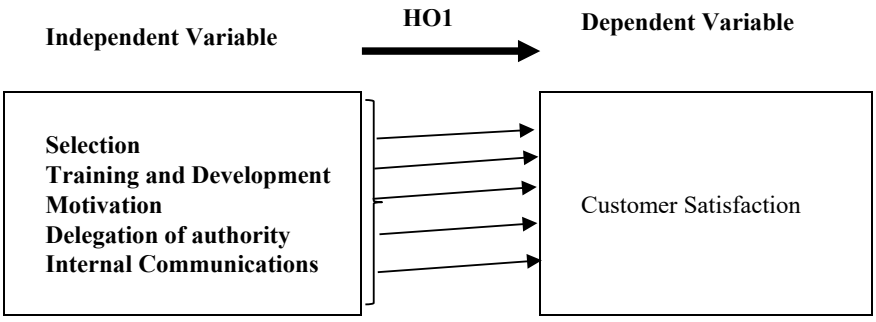


Fig. 1 Study model

- **Motivation of Service Provider**: Motivating people and firing up their drive to be productive in their tasks so as to achieve the goals of the institution. It starts with an external trigger like more pay for more effort but its triumph is hinged on intrinsic determinants associated with an individual's mental disposition [12].
- **Delegation of authority of Service Provider**: Transferring the official authority to another person or the distribution of the right to act and make decisions within a specified scope is referred to as delegation [12].
- **Internal Communications of Service Provider**: The transfer system: it is how information is collected and passed that underpins any decision-making effectiveness but also directly contributes towards high customer quality service by ensuring that all employees get what they need about it and are able to pass it along smoothly.
- **Customer Satisfaction**: Consumption satisfaction is defined by Azzam et al. [16] as the feeling of pleasure or displeasure that results from comparing how well a product or service performs with what was expected by the consumer or customer after consuming or benefiting from it.

3 Study Methodology

A study was conducted that emphasized a set of goals with the main focus being on establishing the connection between service provider's internal marketing elements and customer satisfaction in Islamic banks. This major goal leads to different subgoals which are associated with diverse inquiries, thus shaping the structure of the study. In order to attain these goals, the researchers applied the descriptive-analytical method where qualitative expression delineates the phenomenon and its features as alluded in the theoretical framework, while quantitative expression provides an exact depiction of the phenomenon's extent and volume.

The study was divided into two parts. The first section is the theoretical framework which describes all aspects of the phenomenon and topic in detail, along with a review of previous studies related directly and indirectly to the study topic, internal marketing in banks. The second part presents the quantitative and analytical aspect. This includes a detailed analysis of study data which derives its basis from demographic factors—hypothesis testing and arithmetic means of sample responses.

Two questionnaires were created to collect data from the study samples. One targeted the staff members of International Arab Islamic Bank while the other was meant for the bank's customers. Data from both samples were obtained and subsequently analyzed.

Table 1 Number of clients of the Islamic International Arab Bank

Branch	Number of customers
Zarqa	11,509
Russeifa	4332
North Hill	4506
New Zarqa	7471
Zarqa University	3552
Total	31,370

3.1 Study Population

The sample population was split into two parts: One consisting of the staff members of the International Arab Islamic Bank at all Zarqa city branches, and the other comprising the bank's customers within the same locality. This bifurcation was done in order to align the study's scope with its pertinent factors. Indeed, it would be impractical to gauge the interplay of internal marketing and customer satisfaction using a single homogeneous study group.

- **Bank Employees Population**: The population size was 44 employees distributed across five branches in the city of Zarqa.
- **Bank Customers Population**: The population size was 31,370 customers distributed across five branches. The table below shows the distribution of customers across the five branches (Table 1).

3.2 Study Sample

The researchers used [28] sample size table to choose an optimal sample that represents each study population.

- **Employees Sample**: The study considered all 44 employees due to the low population size. From the questionnaires distributed, 39 were returned which accounted for a non-return rate of five questionnaires, an approximate 87% return rate. Upon data entry, it was noted that six questionnaires were incomplete and not analyzable; this left us with 33 usable questionnaires, amounting to 85% of those returned and representing part of the sample.
- **Customers Sample**: A sample size of 382 customers would be the minimum acceptable representation of the customer population, which consists of 31,370 customers. The researchers distributed 450 questionnaires through simple random sampling.

Fair distribution among branches was determined by calculating the percentage of customers in each branch relative to the total number of customers in Zarqa, and

Table 2 Number of questionnaires distributed in each branch

Branch	Number of customers	Representation percentage (%)	Number of questionnaires distributed
Zarqa	11,509	36.7	165
Russeifa	4332	13.8	62
North Hill	4506	14.4	65
New Zarqa	7471	24	107
Zarqa University	3552	11.3	51
Total	31,370	100	450

consequently establishing the number of questionnaires to be distributed in each branch. The results are illustrated in Table 2.

A sum of 433 questionnaires were returned from the 450 handed out to Zarqa bank clientele, an astonishing 96% retrieval rate. Upon completion of data entry, it was discovered that 42 surveys were unsuitable; nevertheless, there remained 391 serviceable questionnaires which accounted for an impressive 87% of those initially returned.

3.3 Study Tool

In order to gather data from the specified populations, two distinct questionnaires were formulated, as previously indicated. The construction of each questionnaire was customized to suit the specific data requirements of the study sample, incorporating a range of items and variables that were pertinent to the targeted population.

Employee Questionnaire

The initial survey administered to bank employees encompassed a total of 31 items, which aimed to assess five distinct independent variables. Additionally, the questionnaire included a series of inquiries pertaining to the demographic characteristics of the participants. The following table provides a concise overview of the items included in the employee questionnaire (Table 3).

Customer Questionnaire

The customer questionnaire, which aimed to assess customer satisfaction as the dependent variable, consisted of 23 items. Additionally, the questionnaire included a set of items to gather demographic information from the customers. The items of the customer questionnaire are summarized in (Table 4).

The study employed a five-point Likert scale to encode the sample's responses to the items in both questionnaires. Table 5 illustrates this scale.

Table 3 Employee questionnaire items

Axis	Number of items
Part one	
Gender	2
Age	4
Educational level	4
Job Level	3
Number of years working in the bank	4
Part two	
Service provider	5
Training and development of service provider	8
Service provider motivation	7
Delegation of authority of service providers	6
Internal communication of service providers	5

Table 4 Customer questionnaire items

Axis	Number of Items
Part one	
Gender	2
Age	3
Monthly income	3
Educational level	4
Employment sector	3
Number of years dealing with the bank	3
Account type	3
Part two	
Customer satisfaction	23

Table 5 Five-point Likert scale

Response	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Code	5	4	3	2	1

3.4 Internal Consistency Reliability

The degree of consistency in the results of the questionnaire when administered to the study sample is indicated by the reliability coefficient. If the tool produces inconsistent results upon repeated administration, concerns arise regarding the reliability of its findings [4]. The Cronbach Alpha coefficient, which ranges from 0 to 1, was employed to assess the internal consistency of the questionnaire. Reliability

Table 6 Internal consistency reliability (Cronbach alpha) for employee and customer questionnaires

Item	Question items	Cronbach alpha
Selection of service provider	Q1–Q5	0.762
Training and development	Q6–Q13	0.877
Motivation	Q14–Q20	0.976
Delegation of authority	Q21–Q26	0.895
Internal communication	Q27–Q31	0.914
Overall performance (Employees)	Q1–Q31	0.945
Overall performance (Customers)	Q1–Q23	0.875

is considered low if Alpha is below 0.4, moderate if it falls between 0.4 and 0.7, and high if it surpasses 0.7 [4]. Table 6 presents the Cronbach Alpha coefficients for the employee and customer questionnaires, reflecting their internal consistency reliability.

The reliability of all items included in the employee questionnaire was found to be high, as indicated by Alpha values exceeding 0.7. Specifically, the "Motivation of Service Provider" section exhibited the highest reliability, with an Alpha value of 0.976, while the "Selection of Service Provider" section displayed the lowest reliability, with an Alpha value of 0.762. Overall, the items demonstrated a strong internal consistency, with an Alpha value of 0.945. Similarly, the customer questionnaire items exhibited a high level of reliability, with an Alpha value of 0.875.

3.5 Data on Study Sample

Employees

Table 7 displays the demographic characteristics and representation percentages of employees from the Arab International Islamic Bank branches in Zarqa city.

The findings derived from the demographic examination of bank personnel in the city of Zarqa revealed a predominant male presence, constituting approximately 76% of the workforce, while females accounted for approximately 24%. In terms of age distribution, individuals falling within the 25–35 year range constituted the largest proportion, comprising approximately 33% of the total. Equally represented were the age cohorts of 36–46 and 47–57 years, each encompassing approximately 21% of the overall population.

The majority of the participants in the study were individuals employed within the organization, accounting for approximately 70% of the sample. The remaining 30% was divided equally between managers and assistants, each comprising around 15% of the sample. In terms of tenure, the largest proportion of employees, approximately 30%, had been working at the bank for a period of 6–10 years.

Table 7 Demographic data for study sample (Employees)

Item	Demographic information	Frequency	Percentage (%)
Gender	Male	25	75.8
	Female	8	24.2
	Total	33	100
Age	25–35 years	11	33.3
	36–46 years	7	21.2
	47–57 years	7	21.2
	58 years and above	8	24.2
	Total	33	100
Education level	Diploma	3	9.1
	Bachelor's degree	21	63.6
	Postgraduate studies	7	21.2
	Other	2	6.1
	Total	33	100
Job level	Employee	23	69.6
	Assistant	5	15.2
	Manager	5	15.2
	Total	33	100
Years of service	1–5 years	9	27.3
	6–10 years	10	30.3
	11–15 years	7	21.2
	16 years and above	7	21.2
	Total	33	100

Customers

Regarding the demographic characteristics of the customers, Table 8 illustrates the results of the analysis.

In Zarqa City, the customer base of Arab Islamic International Bank is predominantly male, accounting for approximately 62% of the total sample, while females constitute the remaining 38%. The customer demographic exhibits a range of age groups, with the 22–30 age bracket comprising the largest proportion at approximately 37%, while individuals over the age of 46 are the least represented, making up only about 3% of the customer base.

In regards to the various types of accounts, it is notable that a significant portion of customers possess current accounts, encompassing approximately 59% of the total, whereas the percentage of individuals holding investment accounts is comparatively lower, standing at approximately 8%.

Table 8 Description of study sample data (Customers)

Variable	Personal information	Frequency	Percentage (%)
Gender	Male	244	62.4
	Female	147	37.6
	Total	391	100
Age	22–30 years	145	37.1
	31–38 years	138	35.3
	39–46 years	96	24.6
	Over 46 years	12	3.1
	Total	391	100
Education	High school or less	37	9.5
	Diploma	132	33.8
	Bachelor's degree	167	42.7
	Graduate studies	55	14
	Total	391	100
Income	Less than 500 JD	211	54
	501–1000 JD	107	27.4
	More than 1000 JD	73	18.7
	Total	391	100
Employment sector	Private sector	180	46
	Government	164	41.9
	Self-employed	47	12
	Total	391	100
Years with the bank	Less than 1 year	114	29.2
	1–5 years	115	29.4
	More than 5 years	162	41.4
	Total	391	100
Account type	Current account	229	58.6
	Salary account	129	33
	Investment account	33	8.4
	Total	391	100

3.6 Description of Study Variables

The purpose of the study was to assess six variables, with five independent variables being assessed through a questionnaire administered to employees. Customer satisfaction, the dependent variable, was also measured using a questionnaire specifically designed for this purpose. Each variable consisted of a series of items from which inferences could be made. To describe the study variables, measures of central tendency, specifically the mean, were used, along with measures of dispersion, such

as the standard deviation, to determine how responses from the sample varied around the mean. By calculating the arithmetic means of the responses from both samples, the relative importance of each item can be determined, allowing for inferences to be made about the opinions of the participants in the sample.

Service Provider Selection

The first independent variable was measured through 5 items, and Table 9 illustrates the arithmetic means and standard deviations for the variable's items.

Based on the arithmetic means of the items pertaining to the service provider selection variable, it is evident that each of them falls under the category of high relative importance. In summary, the service provider selection variable holds a significant level of relative importance, as indicated by an arithmetic mean of 4.12.

Training and Development Variable for Service Provider

The measurement of the training and development variable was conducted using a total of 8 items. In order to provide a comprehensive overview of this variable, Table 10 has been included, which showcases the arithmetic means and standard deviations.

Based on the arithmetic means, it can be concluded that all items pertaining to the training and development variable hold significant relative importance. The training and development variable itself is deemed highly important, as evidenced by an arithmetic mean of 4.27. This result highlights the bank's strong dedication to consistently offering a diverse range of training programs for its employees.

Table 9 Arithmetic means and standard deviations for service provider selection variable items

Item	Ranking	Mean	Standard deviation	Relative importance
1. The bank prioritizes hiring individuals with high skills that match their job nature	1	4.26	0.663	High
2. The bank selects employees based on a set of criteria and principles	3	4.13	0.331	High
3. The bank ensures that the number of employees matches the number of bank customers	5	3.88	0.781	High
4. The bank's hiring decisions are linked to available vacancies	4	4.12	0.600	High
5. The bank conducts necessary tests and interviews for recruitment	2	4.24	0.830	High
General scale		4.12	0.641	High

Table 10 Arithmetic means and standard deviations for training and development variable items

Item	Ranking	Mean	Standard deviation	Relative importance
6. The bank is keen on developing the skills and competencies of its employees	3	4.38	0.489	High
7. The bank holds training courses for employees regularly	1	4.45	0.754	High
8. The topics and nature of training courses align with employees' job needs	8	4.05	0.631	High
9. The training courses conducted by the bank contribute to my development	4	4.36	0.706	High
10. I participate in future training course topics	2	4.37	0.699	High
11. The bank ensures the selection of highly skilled individuals to deliver training courses	7	4.09	0.601	High
12. The bank adequately invests in training courses	5	4.33	0.736	High
13. There is fairness and equal opportunities among employees to attend training courses	6	4.13	0.636	High
General scale		4.27	0.656	High

Service Provider Motivation Variable

The motivation variable for service providers was measured through 7 items, and Table 10 illustrates the arithmetic means and standard deviations for the variable (Table 11).

The relative importance of the motivation variable items exhibited variation. The arithmetic mean of the motivation variable is 3.79, indicating a high level of significance. This suggests that the bank employs diverse strategies to stimulate and motivate its employees.

Delegation of Authority Variable for Service Provider

The measurement of the delegation of authority variable for service providers was conducted using a set of six items. The corresponding arithmetic means and standard deviations for this variable are presented in Table 12.

Table 11 Arithmetic means and standard deviations for service provider motivation variable items

Item	Ranking	Mean	Standard deviation	Relative importance
14. The bank offers a variety of material incentives to encourage employees to improve their performance	2	3.97	1.015	High
15. The material incentives provided by the bank are fair and commensurate with employees' performance	7	3.61	1.223	Average
16. I receive praise and commendation from my immediate supervisor when I perform well	1	4.12	0.927	High
17. Management makes me feel that I am one of the most important success criteria in the bank	3	3.85	1.278	High
18. There is interest from the bank's management in employees' demands	6	3.63	1.023	Average
19. The bank endeavors to motivate employees in various ways	5	3.65	1.002	Average
20. The bank seeks to consider employees' suggestions for performance improvement	4	3.76	0.830	High
General scale		3.79	1.042	High

The items within the delegation of authority variable exhibited varying levels of relative importance, with the majority falling within the category of average relative importance. From this, it can be deduced that employees possess complete autonomy and decision-making power within the parameters of their delegated authorities and assigned responsibilities.

Internal Communication Variable for Service Providers

The measurement of the internal communication variable for service providers involved the utilization of five items, and Table 13 provides a comprehensive depiction of the arithmetic means and standard deviations associated with said variable.

In relation to the final independent variable, namely internal communication, it is noteworthy that all items are categorized as possessing a significant level of importance. This is demonstrated by the clear assignment of tasks to employees,

Table 12 Arithmetic means and standard deviations for delegation of authority variable items

Item	Ranking	Mean	Standard deviation	Relative importance
21. I can modify the service to meet the customer's needs without resorting to my immediate supervisor	6	2.97	1.237	Average
22. I perform my tasks without continuous supervision from my immediate supervisor	4	3.27	1.398	Average
23. I have the freedom to act in my work according to the delegated authority	1	4.09	0.631	High
24. The bank's management receives my suggestions and encourages them	5	3.12	1.053	Average
25. Management supports employees to perform their tasks to the best of their ability	3	3.39	0.998	Average
26. There is trust from management in employees to provide the best services to customers	2	3.76	0.969	High
General scale		3.43	1.047	High

ensuring that each individual is aware of their expected responsibilities. The variable of internal communication has garnered considerable relative importance, as indicated by an arithmetic mean of 4.12.

In order to ascertain the independent variable with the utmost relative significance, a comparison of arithmetic means and standard deviations is conducted for the variables (Table 14).

Based on the findings, it is evident that the training and development of service providers hold the greatest significance among the variables examined, as indicated by the highest arithmetic mean of 4.27. Conversely, the delegation of authority is deemed to have the lowest relative importance, with an average relative importance of 3.43. Moreover, the dimensions of internal marketing exhibit a considerable level of importance, with an arithmetic mean of 3.94, thereby suggesting that the Arab Islamic International Bank diligently embraces the principles of internal marketing within its branches located in the city of Zarqa.

Customer Satisfaction

Customer satisfaction, the dependent variable, was evaluated using a tailored questionnaire administered to the bank's customers in Zarqa. This questionnaire consisted

Table 13 Arithmetic means and standard deviations for internal communication variable items

Item	Ranking	Mean	Standard deviation	Relative importance
27. Tasks for employees are clear to everyone, facilitating the service delivery process	5	3.88	0.781	High
28. Positive cooperation among employees prevails in the work environment	2	4.24	0.663	High
29. The bank's internal environment is characterized by friendliness and respect among employees, contributing to better work performance	1	4.36	0.699	High
30. Management informs employees about changes in bank policies and goals	3	4.12	0.600	High
31. Information can be easily obtained from colleagues	4	4.00	0.500	High
General scale		4.12	0.649	High

Table 14 Arithmetic means and standard deviations for independent study variables

Variable	Ranking	Mean	Standard deviation	Relative importance
1. Selection of service provider	2	4.12	0.641	High
2. Training and development of service provider	1	4.27	0.656	High
3. Motivation of service provider	4	3.79	1.042	High
4. Delegation of authority to service providers	5	3.43	1.047	Average
5. Internal communication for service providers	3	4.12	0.649	High
General scale		3.94	0.807	High

of (23) items aimed at assessing their level of satisfaction. The corresponding arithmetic means, standard deviations, and relative importance of the dependent variable are presented in Table 14.

The classification of all customer satisfaction items revealed a high level of relative importance. In terms of overall customer satisfaction, it was found that the variable held significant weight, as indicated by an arithmetic mean of 3.97. This suggests that the majority of customers express satisfaction with the performance of employees at Arab Islamic International Bank (Table 15).

4 Testing Study Hypotheses

In order to examine the study hypotheses and address its inquiries, the utilization of the Pearson correlation test was implemented to ascertain the association between the independent and dependent variables.

Hypothesis 1

- H01: There is no statistically significant relationship (at a significance level of $\alpha \leq 0.05$) between service provider selection and customer satisfaction in Islamic banks in Jordan.
- Study Question 2: Is there a relationship between service provider selection and customer satisfaction in Islamic banks in the city of Zarqa?

For testing Hypothesis 1 and answering Study Question 2, the Pearson correlation test was used, and Table 15 illustrates the results (Table 16).

Based on the findings, it is evident that the level of significance in the association between the selection of service providers and customer satisfaction is below the predetermined significance level of 0.05. The computed t-value of 9.725 exceeds the critical t-value of 1.96. As a result, we can reject the null hypothesis and accept the alternative hypothesis, which states that there is a statistically significant relationship (with a significance level of $\alpha \leq 0.05$) between the selection of service providers and customer satisfaction in Islamic banks in Jordan.

The correlation between the variables is moderately positive, with an R value of 0.451, which falls within the moderate strength range according to Cohen's (1988) classification. The service provider variable accounts for 20.3% of the variance in customer satisfaction, as indicated by the value of R^2. Consequently, Study Question 2 has been successfully addressed.

The examination outcomes additionally demonstrate that a modification of one unit in the independent variable (selection of service provider) leads to a corresponding alteration of 0.428 units in the dependent variable (satisfaction of the customers), as deduced from the obtained value of B obtained through the process of simple linear regression analysis.

Table 15 Arithmetic means and standard deviations for customer satisfaction variable items

Item	Ranking	Mean	Standard deviation	Relative importance
1. The number of bank employees is proportional to the number of customers, facilitating quick transaction processing	2	4.31	0.797	High
2. Bank employees possess high efficiency and skill in providing excellent service	1	4.37	0.712	High
3. Service providers are characterized by high accuracy and speed in execution	3	4.25	0.814	High
4. Service providers have the ability to solve problems even if they are beyond their authority	23	3.12	1.121	Average
5. I am satisfied with the level of cooperation among bank employees when providing service to customers	6	4.08	0.869	High
6. The bank continuously seeks to improve services provided to customers by increasing the efficiency of workers	8	4.05	0.820	High
7. I do not have to wait long to get the desired service	17	3.90	0.923	High
8. Bank employees deal fairly and transparently with all customers	14	3.94	1.080	High
9. The relationship between bank employees and customers is characterized by respect and appreciation	22	3.81	1.085	High
10. The bank continuously informs me about new services it offers	20	3.83	1.114	High
11. Bank employees have sufficient information about the services provided by the bank	4	4.22	0.802	High

(continued)

Table 15 (continued)

Item	Ranking	Mean	Standard deviation	Relative importance
12. Service delivery procedures to customers are comfortable and free of complications	5	4.15	0.861	High
13. The bank always meets my needs and desires	9	4.04	0.977	High
14. The bank consistently seeks my opinion on the quality of service provided	16	3.93	1.022	High
15. The bank provides sufficient information about its activities to customers	10	3.99	0.979	High
16. Bank employees provide sufficient and clear details about the costs of the service provided to customers	11	3.98	0.874	High
17. Services provided by the bank exceed my expectations	21	3.82	0.980	High
18. The bank ensures to select employees who have sufficient experience to provide excellent services	18	3.83	0.997	High
19. The training courses held by the bank contribute to providing excellent services to customers	15	3.94	0.888	High
20. I feel that bank employees are motivated to perform their tasks excellently	13	3.95	0.808	High
21. Bank employees have the authority to deal directly with emergency cases	19	3.83	1.086	High
22. Service delivery procedures are easy, convenient, and fast	12	3.96	0.867	High

(continued)

Table 15 (continued)

Item	Ranking	Mean	Standard deviation	Relative importance
23. Members of the bank's team work with high spirits enabling them to perform their tasks well	7	4.06	0.806	High
General scale		3.97	0.925	High

Table 16 Results of hypothesis 1 testing

Variables	R	R^2	t	Tabulated t	B	Sig
Service provider selection	0.451	0.203	9.725	1.96	0.428	0.000
Customer satisfaction						

4.1 Recommendations

1. Empower Arab Islamic International Bank employees, reduce restrictions on their tasks and make it easier to solve some problems without having to refer to their direct superiors.
2. Identify employee training needs by relevant department and stay updated with developments and innovations in the world of Islamic banking.
3. Continue to offer training programs systematically and periodically.
4. The management of Arab Islamic International Bank should diversify the incentive system and create a fair mechanism adapted to the nature of achievements, offering material incentives based on results.
5. Updating and strengthening the selection criteria for service providers, focusing primarily on competencies rather than skills.
6. Build an atmosphere of kindness and love among bank employees, making it one of the bank's values that should be disseminated among employees.
7. Continuously strive to achieve employee professional satisfaction and motivate them to achieve customer satisfaction.
8. Develop strategies to strengthen the marketing dimensions of Arab Islamic International Bank, allocate sufficient budget for this purpose and incorporate it into the bank's policies.

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The Role of Administrative Communication in Achieving the Effectiveness of Administrative Decisions in Private Sector Institutions



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Abstract This study aimed to identify the role of administrative communication in achieving the effectiveness of administrative decisions. The study was conducted on private sector institutions in the Bethlehem Governorate. To achieve the objectives of the study, the research team prepared a questionnaire to collect the necessary data from its various sources to achieve those goals. Analytical study and questionnaire as a main tool for collecting information. The study was conducted on a random sample of (58) questionnaires. The sample items were distributed to the study population of employees of private sector institutions in the Bethlehem Governorate. The study reached several results, the most important of which are: The results showed that the degree of employees' evaluation of the patterns of administrative communication was large, as the most common manifestations were the communications issued by managers to employees facilitate obtaining the information necessary for decision-making, followed by facilitate communication between employees at the same administrative level to obtain information before making decisions. The results showed that the degree of the means of administrative communication was great, as the most common manifestations were the social media contribute among the workers by providing the information required to make the decisions, then the means of oral communication among the workers contribute to the provision of the necessary information to make the decisions. The results showed that the degree of workers' evaluation of administrative communication skills was large, as the most common manifestations were that workers considered written communications more accurate and safer, followed by workers characterized by written skills that express what they want clearly.

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1 Introduction

Administrative communication represents a fundamental means for making sound managerial decisions and is essential for fostering unity and collaboration among departments within an organization. Continuous interaction with the environment, characterized by recurring challenges such as competition, changes in customer lifestyles and preferences, and technological advancements, necessitates successful organizations to adapt their administrative processes. As change and development occur continuously, there is a need for the emergence of new communication and development methods to increase efficiency, effectiveness, and achieve organizational success and development. Administrative communications constitute one of the necessary administrative elements for making managerial decisions, as the communication process is closely linked to human interaction within the organization to facilitate communication, information transfer, and exchange of experiences [1–11].

Communication is one of the most essential executive tools without which any management cannot perform its duties effectively, as it constitutes the common element in all administrative operations. The more efficient and effective the communication process is, the easier it is to pass information to the parties responsible for decision-making within the organization flexibly and in a timely manner. The inability of communication to convey and deliver this information at the required speed and accuracy constitutes a barrier to this process [12–18].

Therefore, communication today has become a matter of great interest in the fields of management and organization, whether by researchers or practitioners, as communications are the nerve center of the organization, its beating heart. They propel activity and vitality throughout its parts, and without them, decisions and information remain stagnant, and the administrative process comes to a complete halt. The entire management activity leads to communications [19–31].

1.1 Problem Statement

Administrative communications within public institutions are considered a fundamental and necessary process and a significant criterion for measuring the development and success or failure of these institutions in achieving their goals. However, this does not mean that attention to the subject of communication is limited only to its technical aspects, equipment, and technological means. It is a human and social process that connects individuals within the institution and coordinates between the

units of the same institution and its interests. Based on this, the problem of the study can be formulated in the main question:

What is the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate?

Significance of the Study: The importance of this study lies in:

1. Monitoring and analyzing the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate and highlighting the role and importance of these activities in providing effective information contributing to making effective managerial decisions.
2. Revealing the most important administrative communication technologies used by private sector institutions in Bethlehem Governorate to obtain necessary and essential information.
3. The recommendations resulting from this study will help in the development and enhancement of the efficiency of managers in the process of effective communication.

1.2 Study Objectives

The study aimed to achieve the following objectives:

1. The role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate.
2. Identifying the nature of administrative communications used in private sector institutions in Bethlehem Governorate by understanding (patterns, means, and skills of administrative communications).
3. Identifying the characteristics of information available and resulting from administrative communications in private sector institutions in Bethlehem Governorate in terms of timing, accuracy, comprehensiveness, clarity, flexibility, and ease of access.

1.3 Study Questions

1. What are the patterns of administrative communications in private sector institutions in Bethlehem Governorate?
2. What are the means of administrative communications in private sector institutions in Bethlehem Governorate?
3. What are the skills of administrative communications in private sector institutions in Bethlehem Governorate?
4. What are the characteristics of information resulting from administrative communications in private sector institutions in Bethlehem Governorate?

5. To what extent does administrative communication contribute to the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate?

1.4 Study Hypotheses

1. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate attributed to the gender variable.
2. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate attributed to the educational qualification variable.
3. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate attributed to the years of experience variable.
4. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate attributed to the job title variable.
5. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate attributed to the monthly income variable.

2 Study Methodology

The research team utilized the descriptive analytical methodology, which aims to identify the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in Bethlehem Governorate. The descriptive analytical methodology attempts to compare, interpret, and evaluate in order to arrive at meaningful generalizations that enhance the knowledge about the subject.

2.1 Study Population

This study addressed the topic of the role of administrative communication in achieving the effectiveness of managerial decisions in private sector institutions in

Bethlehem Governorate. Accordingly, the study population consisted of employees of private sector institutions in Bethlehem Governorate.

2.2 Study Sample

The study was conducted on a random sample of (58) questionnaires distributed among the study population of employees of private sector institutions in Bethlehem Governorate.

2.3 Study Instrument

The questionnaire was constructed to obtain the perspectives of respondents on the study topic.

2.4 Study Instrument Reliability

The reliability of the study instrument was verified by examining the internal consistency of the instrument items by calculating the Cronbach's Alpha coefficient on the total study sample, where the reliability value was (0.93), indicating a very high degree of reliability.

3 Results

Study Question 1: What is the degree of the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate?

The degree of the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate was significant, with the mean score for this degree on the total scale of the study measure being (3.97), with a standard deviation of (0.48).

Study Question 2: What are the most important aspects of employee evaluation of administrative communication patterns?

The degree of employee evaluation of administrative communication patterns was significant, with the mean score for this degree being (4.09). The most common aspects were facilitating communication from managers to employees to obtain necessary information for decision-making, with an average of (4.26), followed by

facilitating communication among employees at the same administrative level to obtain information before making decisions, with an average of (4.19).

Study Question 3: What are the most important aspects of administrative communication means?

The degree of administrative communication means was significant, with the mean score for this degree being (3.94). The most common aspects were the contribution of social media among employees in providing the necessary information for decision-making, with an average of (4.12), followed by the contribution of oral communication among employees in providing necessary information for decision-making, with an average of (4.09).

Study Question 4: What are the most important aspects of employee evaluation of administrative communication skills?

The degree of employee evaluation of administrative communication skills was significant, with the mean score for this degree being (3.82). The most common aspects were employees considering written communications more accurate and secure, with an average of (3.93), followed by employees having writing skills that clearly express what they want, with an average of (3.93).

Study Question 5: What are the most important aspects of employee evaluation of characteristics of information resulting from administrative communication?

The degree of employee evaluation of characteristics of information resulting from administrative communication was significant, with the mean score for this degree being (3.93). The most common aspects were internal communication information being characterized by timely availability, with an average of (4.31), followed by internal communication information being characterized by accuracy, with an average of (3.93).

Study Question 6: What are the most important aspects of the effectiveness of managerial decisions?

The degree of the effectiveness of managerial decisions was significant, with the mean score for this degree being (4.04). The most common aspects were administrative communication contributing to providing information that aids in making timely managerial decisions, with an average of (4.31), followed by administrative communication contributing to providing information that facilitates the implementation of managerial decisions, with an average of (4.21).

Hypothesis 1:

- Hypothesis: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to gender.
- Findings: The results revealed statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to gender, with differences favoring females.

Hypothesis 2:

- Hypothesis: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to educational qualification.
- Findings: The results showed no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to educational qualification.

Hypothesis 3:

- Hypothesis: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to job title.
- Findings: The results indicated no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to job title.

Hypothesis 4:

- Hypothesis: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to monthly income in shekels.
- Findings: The results revealed no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to monthly income in shekels.

Hypothesis 5:

- Hypothesis: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to years of experience.
- Findings: The results indicated no statistically significant differences at the $\alpha \leq 0.05$ level in the role of administrative communication in achieving the effectiveness of managerial decisions in the private sector in Bethlehem Governorate attributed to years of experience.

4 Conclusion

In conclusion, the study findings indicate that private sector institutions in Bethlehem Governorate place a strong emphasis on the role of administrative communication in achieving the effectiveness of their decision-making processes. The results demonstrate that employees highly evaluate the patterns of communication from managers, which facilitate access to the necessary information for informed decision-making. Additionally, the study reveals that the institutions leverage a variety of communication means, including social media and oral channels, to enable information sharing among workers and support the decision-making requirements. Furthermore, the workforce appears to have strong written communication skills, which they view as a key factor in conveying information accurately and clearly for decision-making purposes. Overall, the findings suggest the private sector organizations recognize the critical importance of robust and effective administrative communication in enhancing the quality and outcomes of their decision-making, which is vital for organizational success and competitiveness. Maintaining these communication best practices seems to be a strategic priority for the institutions examined.

5 Recommendations

Based on the study findings, the following recommendations can be made:

- Utilize the expertise of communication technology specialists to establish a communication system linking the private sector to enhance the effectiveness of managerial decisions.
- Address deficiencies and obstacles hindering the efficiency of communication technologies, including technological, personal, and organizational obstacles.
- Develop written, verbal, and electronic administrative communication methods to provide necessary information and train employees to master these methods for more accurate and beneficial information outcomes.
- Provide financial and moral incentives to encourage employees to rely on technology in communication.
- Increase focus on administrative communication patterns among employees at the same managerial level and between managers and employees to provide information with specific characteristics that make managerial decisions more effective.
- Consider precision in timing during administrative communication between supervisors and subordinates, as this positively impacts the nature of the relationship with employees, as long waiting times for communication with supervisors and imprecision in timing lead to a lack of desire to communicate, thus losing the desired benefits of communication.

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The Extent of Application of IFRS to SMEs: A Case Study of a Dairy Company



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Abstract The objective of this study is to assess the implementation of the IFRS for Small and Medium-sized Enterprises (IFRS for SMEs) in Jordan, which was issued by the International Accounting Standards Board in 2009. To achieve this objective, a descriptive inferential approach is employed, with the Jordanian Dairy Company selected as a representative case study. A total of 41 questionnaires were collected, representing a response rate of 95.3%. After ensuring the validity of the retrieved questionnaires for analysis, it was determined that all of them were suitable for analysis. The data obtained is analyzed using the SPSS program. The findings of the study reveal that the Jordanian Dairy Company demonstrates a high level of compliance with the IFRS for SMEs. The study participants confirmed that their organization adheres to the specific items of the standard that were examined, including the adopted policies, disclosed information, and presentation of financial statements. Based on the results, several recommendations are put forth. These recommendations encompass both the general application of the IFRS for SMEs and the specific actions that the Jordanian Dairy Company should undertake. They emphasize the importance of providing ongoing support to small and medium-sized enterprises, facilitating their transactions and financing. Additionally, the evaluation of the accounting systems of these establishments in accordance with international accounting standards was deemed necessary.

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1 Introduction

SMEs, which encompass industrial, commercial, and certain service sectors, are categorized based on their size, with distinctions made in terms of employee count and annual revenues. Throughout the twentieth century, there was a notable increase in the recognition and focus placed on these enterprises, leading researchers and economic specialists to promote their establishment and facilitate their growth.

The significance of SMEs in driving economic growth, fostering employment opportunities, enhancing value creation, and facilitating export activities is widely acknowledged, making them a fundamental component of numerous global economies. Recognizing the unique reporting needs of entities without general-purpose financial reporting, the International Accounting Standards Board sanctioned the IFRS for SMEs in 2009, outlining the overarching objectives of financial statements.

In light of the transformation of the accounting field resulting from the global expansion of financial markets, the IFRS for SMEs was formulated with the aim of addressing the requirements of financial statement users for SMEs. However, in order for these financial statements to effectively fulfill their intended purpose, they must encompass information that possesses a notable degree of quality and comparability. As a result, small and medium enterprises face the difficulty of covering the expenses related to complying with these standards.

When nations embrace the IFRS for SMEs interesting things can happen. For instance, a positive outcome could be favorable loan conditions extended by major lenders like the IMF and World Bank, as indicated by Tyrrell et al. [5]. These standards are more than just numbers on a page. They act as a tacit agreement between organizations and their stakeholders through the accounting process. A promise made that those who rely on these reports will benefit from others' commitment to honesty (integrity) and justice (fairness) without compromising any aspect that is substantial.

The economy of Jordan greatly depends on SMEs as a vital part of its economy. Jordan has been demonstrating its adherence to international laws and regulations for more than ten years with regard to implementation of international accounting standards. Nevertheless, these enterprises encounter significant challenges when it comes to the practical application of these standards.

The primary objective of this research is to evaluate the degree to which the IFRS for SMEs has been implemented in Jordan. The research problem revolves around the obstacles encountered by the SME sector in Jordan when it comes to adhering to IFRSs and their preparedness to embrace these standards, as mandated by the Securities Commission instructions. Consequently, the research aims to address the following central inquiry:

- What is the extent of the implementation of the IFRS for SMEs in Jordan?

1.1 Previous Studies

The employment of SMEs holds a prominent position in the country, making it a crucial sector. Consequently, numerous researchers have directed their attention towards this sector, particularly focusing on the adoption of IFRS by SMEs. In a study conducted by Khalifa and Abdullah [4], they examined the application of the International Accounting Standard for SMEs in Libyan enterprises, highlighting the absence of full compliance with Libyan standards. Their findings revealed both similarities and disparities between the complete international standards and the SME standard. Similarly, Almasmari [2] discovered that the implementation of IFRS enhances current expectations and facilitates informed decision-making, as the accounting information prepared in accordance with these standards accurately reflects the company's operations and economic events. In the context of emerging economies, Albu et al. [1] confirmed strong support from these countries for the adoption of international standards for SMEs. However, Gonçalves et al. [3] pointed out logistical deficiencies in the mandatory application requirement in certain nations.

This particular study distinguishes itself from previous research endeavors by delving into a relatively unexplored area which is the IFRS for SMEs. This standard holds substantial importance within the global economy, making it a topic of great significance. The study aims to assess the level of implementation of this standard specifically within the context of Jordan.

1.2 Research Hypotheses

Based on the study problem and its questions, the study hypotheses were formulated as follows:

- HO: "The IFRS is not fully implemented in SMEs in Jordan."

1.3 Research Methodology

The study relied on the descriptive inferential approach.

1.4 Community and Study Sample

The research sample encompasses the entire workforce employed in the finance division of the Jordanian Dairy Company PLC. The audit and analysis team encompasses various job roles, including the financial manager, department head, internal auditor, and accountant, resulting in a total of forty-three employees as reported by the Human Resources Department for the year 2022. A survey instrument was developed and disseminated to all finance department personnel at the Jordanian Dairy Company PLC, with a retrieval of forty-one completed questionnaires, representing 95.3% of the total sample size.

1.5 Data Collection Sources

To achieve the study objectives, the researchers utilized two main sources:

1. **Secondary Sources**: In order to establish the theoretical framework, various secondary data sources were employed, encompassing books, both Arabic and foreign references, peer-reviewed scientific journals, publications, official documents, research papers, and theses. Furthermore, electronic information sources and websites accessible through the World Wide Web were consulted to acquire pertinent information, grasp associated concepts, and remain abreast of the most recent advancements.
2. **Primary Sources**: The research utilized a specifically designed questionnaire that was tailored to match the focus and title of the study. The questionnaire consisted of two sections: a personal data section with five questions, and a second section comprising a total of twenty-nine questions. The questions' response choices were organized in Likert scale to determine whether the participants agreed or disagreed with the statements and to what degree. The Likert scale was composed of five response options: strongly agree, agree, neutral, disagree, and strongly disagree.

1.6 Reliability of the Study Instrument

What defines the reliability of a scale is its ability to provide consistent results when measurements are repeated under similar conditions. The Cronbach's Alpha coefficient is used for the assessment of reliability; any value above 70% in a test of reliability is good enough, while higher values would denote more likelihood of the instrument being reliable. The outcome of this test is presented in Table 1.

Upon analyzing the information presented in Table 1, it is evident that the Cronbach's Alpha value obtained is 0.896, which signifies a high level of reliability. As a result, it can be concluded that the research instrument utilized in this study can

Table 1 Results of reliability test based on Cronbach Alpha

Statement	Number of items	Cronbach Alpha
The implementation of the IFRS for Small and Medium-sized Enterprises, which was released by the International Accounting Standards Board in the year 2019	29	0.896

be deemed reliable, and the data collected can be considered suitable and highly reliable, surpassing the minimum threshold of 70%.

2 Results and Indicators of Descriptive Statistics for the Study Scale

In this section, the second part of the questionnaire is described and analyzed in which, the arithmetic means and standard deviations are computed to evaluate the level of consensus and ascertain the significance of these questions. Through the execution of these procedures, the findings yield the following outcomes:

The findings presented in Table 2 demonstrate that the study sample placed a relatively high level of importance on adhering to the IFRS for SMEs. The average score for the total sample was 4.05, with a standard deviation of 0.405. The individual question scores ranged from 3.32 to 4.46. Question (16), which assesses whether the institution prepares its financial statements for both the parent entity and its subsidiaries using consistent accounting policies, received the highest ranking with an average score of 4.46 and a standard deviation of 0.552, indicating a high level of importance. Following closely behind in the second rank was Question (17), which focuses on whether the institution discloses whether the financial statements are consolidated or separate, with an average score of 4.44 and a standard deviation of 0.550, also indicating a high level of importance. Conversely, Question (19) obtained the second-to-last rank, addressing whether the institution accounts for all changes in accounting policies retrospectively, with an average score of 3.41 and a standard deviation of 1.117, indicating a moderate level of importance. Lastly, Question (5) received the lowest ranking, which explores whether the institution recognizes its assets as assets even if they are not owned by the institution, with an average score of 3.32 and a standard deviation of 0.934, also indicating a moderate level of importance.

3 Statistical Inference Results

In this section, the main hypothesis was tested using statistical inference through a One Sample T-Test, aiming to answer the study question based on decision rules.

Table 2 Results and indicators of descriptive statistics for study tool questions

#	Question	Mean	Standard deviation	Percentage	Level	Rank
1	The institution does not delete any financial data suitable for users' needs even if it is difficult for some users to understand	4.15	0.615	83	High	12
2	The institution presents its financial data neutrally that does not influence decision-making and judgments	4.34	0.728	86.8	High	4
3	The institution accounts for transactions and events and presents them in financial statements according to their essence, not just form	3.95	0.631	79	High	20
4	Employees do not exert significant effort and cost to obtain less important information for users	3.98	0.821	79.6	High	19
5	The institution recognizes its assets as assets even if they are not owned by the institution	3.32	0.934	66.4	Medium	29
6	The institution declares its acceptance of specific responsibility within its financial statements	3.73	0.975	74.6	High	26
7	The institution does not prove any assets, liabilities, income, and expenses that have no cost or measurable value	3.90	0.583	78	High	23

(continued)

Table 2 (continued)

#	Question	Mean	Standard deviation	Percentage	Level	Rank
8	The institution does not make a trade-off between its assets and valuation allowances like depreciation and uncollectible amounts	4.32	0.986	86.4	High	6
9	The institution makes a clear statement without reservation in the disclosures showing its commitment to the IFRS for Small and Medium-sized Entities	4.15	0.792	83	High	13
10	The institution discloses the number of its authorized shares within the financial statements or disclosures, matching the number of shares outstanding at the beginning and end of the financial period	4.44	0.634	88.8	High	3
11	The institution presents an analysis of expenses based on their nature or function	4.00	0.837	80	High	18
12	The institution presents the effects of changes in accounting policies and corrections of errors in the statement of changes in equity	4.07	0.755	81.4	High	14
13	The institution provides explanations about the preparation principles of financial statements and the accounting policies used	4.15	0.853	83	High	11

(continued)

Table 2 (continued)

#	Question	Mean	Standard deviation	Percentage	Level	Rank
14	The institution discloses in the explanations the estimates and judgments made by management that have a significant impact on the amounts reported in the financial statements	3.95	0.835	79	High	21
15	The institution prepares its financial statements for the parent entity and its subsidiaries with the same reporting date	4.29	0.750	85.8	High	7
16	The institution prepares its financial statements for the parent entity and its subsidiaries with consistent accounting policies	4.46	0.552	89.2	High	1
17	The institution discloses whether the financial statements are consolidated or separate	4.44	0.550	88.8	High	2
18	The institution selects and applies accounting policies consistently for similar transactions and events	4.22	0.652	84.4	High	9
19	The institution accounts for all changes in accounting policies retrospectively	3.41	1.117	68.2	Medium	28
20	The institution discloses the nature of changes in accounting estimates and their impact on financial statement items	4.07	0.877	81.4	High	16

(continued)

Table 2 (continued)

#	Question	Mean	Standard deviation	Percentage	Level	Rank
21	The institution corrects material errors of prior periods to the extent practicable	3.85	0.910	77	High	25
22	The institution recognizes financial assets and liabilities arising from contractual agreements at the undiscounted cash amount due	4.22	0.475	84.4	High	8
23	The institution measures its property investments at fair value, with changes in fair value recognized in profit or loss	4.20	0.901	84	High	10
24	The institution recognizes goodwill arising from business combinations as an asset and measures it at cost	3.90	0.800	78	High	22
25	The institution recognizes its contingent assets only if it is virtually certain that future economic benefits will be received	3.59	1.161	71.8	Medium	27
26	The institution measures its revenue at the fair value of the consideration received or receivable	4.07	0.755	81.4	High	15
27	The institution discloses the necessary information for users to understand the financial impact of current and deferred taxes	4.34	0.656	86.8	High	5

(continued)

Table 2 (continued)

#	Question	Mean	Standard deviation	Percentage	Level	Rank
28	The institution discloses events occurring after the end of the reporting period that do not require adjustments	4.05	0.865	81	High	17
29	In the event that the establishment is not using the standard for small and medium-sized enterprises and adopts it, or vice versa, it shall disclose this and the reasons behind it	3.88	0.748	77.6	High	24
The total average score		**4.05**	**0.405**	**81%**	**High**	

3.1 Main Hypothesis Test Result

- HO: "The IFRS is not fully applied in small and medium-sized enterprises in Jordan.
- Ha: The IFRS is fully applied in small and medium-sized enterprises in Jordan."

In order to assess the validity of the primary hypothesis and ascertain the extent to which small and medium-sized enterprises in Jordan adhere to the IFRS, a One Sample T-Test was conducted. The purpose of this statistical test is to analyze whether the mean of the sample significantly deviates from the mean of the population. The outcomes of this analysis are presented in Table 3.

The statistical test results for the main hypothesis model are displayed in Table 3, revealing that small and medium-sized enterprises in Jordan completely adhere to the IFRS (IFRS). The calculated T-value (16.591) surpasses the critical T-value (2.021), signifying the significance of this model at a one-degree of freedom, with a significance level (Sig = 0.00) lower than (0.05).

Table 3 Main hypothesis testing results

T. calculated	T. critical	T. SIG	Degree of freedom (DF)	Test result
16.591	2.021	0.00*	40	Rejected

* Statistically significant at the 0.05 level

T. Critical value at one degree of freedom (N − 1)

According to Leech et al., the extent of application can be determined using the formula:

$$\text{Application Extent} = \text{T-value}/\sqrt{\text{n}}$$

where

T = test value
n = sample size.

Upon computation of the value denoting the degree of application, it is possible to derive its interpretation. A value below 0.20 is classified as low, while a value between 0.20 and less than 0.80 is categorized as medium. Conversely, a value surpassing 0.80 is deemed high. In the present scenario, the degree of application is classified as high, given that it exceeds the threshold of 0.80.

According to the findings derived from the One Sample T-Test, the null hypothesis (HO) is rejected in favor of the alternative hypothesis (Ha), which posits that the IFRS (IFRS) is comprehensively implemented within the context of small and medium-sized enterprises located in Jordan.

4 Discussion of Results

1. The results of the study showed that the attitudes of financial department employees at Jordan Dairy Company reached a high, 81%, level of application of the IFRS in small and medium-sized enterprises, as defined by the International Accounting Standards Board in 2009.
2. The study results also showed that Jordan Dairy Company presents its financial data fairly and impartially, without influencing decision-makers, making their decisions more appropriate and credible.
3. The Company provides all information necessary for users to understand the financial impact of current and deferred taxes on all transactions and events in the Company.
4. The Company presents its assets and liabilities separately in its financial statements, without offsetting them, unless the standard allows it.
5. The Company recognizes its financial assets or liabilities under contracts in the amount required in cash, without any deductions.

4.1 Results Related to the Study Hypothesis

According to the outcomes of the One Sample T-Test, we can conclude that the null hypothesis (HO) is rejected and the alternative hypothesis (Ha) is accepted. This alternative hypothesis asserts that the application of the IFRS is prevalent among

small and medium-sized enterprises in Jordan. These findings align with earlier investigations conducted by Al-Abayji, Abu Risha, and Kilic et al..

5 Recommendations

Taking into account the research results and the research tool, the researchers formulated several recommendations and proposals:

1. Identify compatible methods and procedures for solving the financial problems of small and medium-sized enterprises in a way that contributes to their development and strengthens their economic role.
2. Develop studies and research focusing on the weaknesses of small and medium-sized enterprises that make it difficult for them to apply the IFRS.
3. Establish a consensus-based standard for the classification of Jordanian small and medium-sized enterprises, consistent with international standards, in particular the standard set for this purpose in the International Accounting Standards for these enterprises.
4. Assessing Jordan's financial accounting system to align it with international standards to facilitate global integration.

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The Greening of Finance: Including Sustainability in the Banking Environment



Islam Abdeljawad, Muiz Abu Alia, Aladdin Dwekat, and Samah Mohammed Herzallah

Abstract This study examines the integration of sustainability into the Palestinian banking sector, with a specific focus on the principles and practices of green banking. The research explores implementation strategies and evaluates the potential of green banking to align with the United Nations Sustainable Development Goals (UN SDGs), thereby promoting a more sustainable future for Palestine. This conceptual study conducts an in-depth analysis of the landscape of green banking including a comprehensive review of recent literature, an examination of financial institution websites, and a scrutiny of relevant documents from the Palestinian Monetary Authority (PMA). The research assesses theoretical frameworks, practical implementation strategies, and real-world outcomes. The findings suggest that Palestinian banks, given their substantial financial influence, can play a pivotal role in addressing sustainability development through the adoption of "green banking" practices. This entails prioritizing sustainable investments, advocating for environmental protection, and fostering economic growth by supporting green businesses. The adoption of green banking emerges as a mutually beneficial solution for both the environment and future prosperity. Consequently, this study serves as a baseline for evaluating the effectiveness of Palestinian banking initiatives in promoting a more sustainable environment. Its significant contribution lies in advancing long-term societal benefits by fostering climate improvement and ensuring a sustainable future.

Keywords Green finance · Green banking · Environmental innovation · Green economy · Sustainability · Palestine

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1 Introduction

Today, the financial landscape is evolving fast towards Green practices and the incentive is to consider sustainability concerns on a global scale [1, 2]. Green banking, a topic of great prominence at both the international and local scale, shows how financial institutions are actively pursuing a path that is in line with the principles of sustainability [3]. Basically, green banking is a concept that has two main objectives: to foster the growth of sustainable development and to minimize climate change, especially its negative effects [3]. This shift will highlight the fact that the economic and ecological priorities are now converging, meaning that for stakeholders, policymakers, and researchers alike, there must be a thorough understanding of green banking [4].

The financial crises, along with the growing economy complexities and the fact that the sustainability, the contemporary marketing strategies and the innovative methodologies are crucial for the national development, is what pushed the banking system to that metamorphosis [1, 2]. Besides, the emerging issues of the credit crisis have created doubts about the usual banking framework, demanding the inclusion of ethics into financial operations [2].

Green banking is built on the greener finance base which comprises of the less frequent green deposits and credits as well as the green investment strategies that aim at the environmental conservation. This integrated or complete approach, which is now an inextricable part of the financial services field, has been brought about by Zhelyazkova and Kitanov [5]. As stated by Dafermos and Nikolaidi [6], green loans' function is to channel the investments to ecologically-sensitive infrastructure. This serves the purpose of lessening the ecological footprint through the non-fossil-fuel utilization. In the meantime, the case on point is markedly distinct from the case of the conventional loan, which is in a class of its own. The environment is the direct link between the loan and global warming.

Financial institutions increasingly advocate for green loans by imposing lower interest rates and less restrictive limits compared to their conventional counterparts. These decisions not only influence investment patterns but also directly impact carbon emissions, shaping the trajectory of global warming. Furthermore, such choices significantly affect the financial health of institutions, potentially altering their leverage through varying credit provisions [7]. Proposals to assess the macroeconomic and financial system implications of favoring green loans via the Green Supporting Factor (GSF) and penalizing conventional loans through the Dirty Penalizing Factor (DPF) highlight this dynamic. The GSF suggests a 25% reduction in risk weight on green loans, while the DPF proposes a reciprocal 25% increase in risk weight on conventional loans based on their environmental footprint [6].

Understanding the dynamic landscape of green banking is essential for shaping effective policies and strategies to promote environmental sustainability. This study addresses this imperative by exploring the status of green financing in Palestine. We leverage the current knowledge on green finance to benchmark the landscape specific to the Palestinian banking sector. This exploratory approach delivers valuable

insights for stakeholders, policymakers, and researchers aiming to advance green banking in Palestine towards a more sustainable future. It is useful to raise such an issue in Palestine because of its exceptional circumstances represented by political instability resulting primarily from the occupation [8–11]. The restrictions imposed by the occupation undoubtedly affect all sectors, including the banking sector [12, 13]. Besides, Palestine lacks resources and suffers economic backwardness [14–17]. Therefore, evidence presented by this study provides an important contribution to the literature on green finance taking into account the generalizability of its findings to similar countries in term of economic, cultural and political aspects [18–20].

Through this in-depth investigation, we not only contribute to the theoretical understanding of green banking but also provide practical implications for real-world applications. Our findings can guide the development of targeted policies, effective green financing strategies, and innovative banking practices aligned with environmental responsibility.

2 Literature Review

2.1 Sustainability

The urgency of sustainability has become a fundamental imperative in the face of escalating climate crises. Droughts, extreme storms, coastal flooding, rising sea levels, and tsunamis pose significant threats to the viability of our current way of life and the growth potential of all nations [21]. This stark reality calls for bold, long-term initiatives centered around green solutions, not only implemented by businesses but embraced by a global coalition of stakeholders. Investing in sustainable practices is no longer optional,it is our collective responsibility to safeguard our shared future and planetary well-being [22, 23].

Within this global imperative, green banking emerges as a powerful force for positive change. Given the financial sector's central role in resource allocation and influence on economic activities, the embrace of green principles by financial institutions can catalyze a systemic shift towards sustainable development [6, 24]. Green banking practices, including green loans, investments in renewable energy projects, and sustainable product offerings, can incentivize businesses and individuals to adopt environmentally responsible practices. Furthermore, by leveraging their risk management expertise, green banks can identify and mitigate environmental risks, fostering a more resilient and sustainable financial system [21]. This partnership between sustainability and green banking becomes a dynamic engine, propelling us towards a future where economic prosperity and environmental well-being are mutually reinforcing, rather than at odds [25].

This shift towards sustainability represents a profound transformation in global discourse and action, driven by the vital need to balance economic growth with social well-being and environmental care [26]. This commitment translates into ensuring

the fulfillment of present needs while also preserving resources and opportunities for future generations [4]. Consequently, sustainability has become a criterion by which businesses assess their operations and activities, striving to align them with the ethical imperative of protecting people, planet, and the environment [27].

2.2 Green Finance

Green finance encompasses a range of financial services dedicated to environmental improvement, climate change mitigation, and efficient resource utilization. Its fundamental objective is to achieve long-term sustainable development by striking a balance between economic progress, environmental stability, and ecological conservation [28]. This emerging financial trend seeks to harmonize economic gains with environmental preservation, making it a preferred means of supporting environmentally conscious initiatives and organizations dedicated to ecological protection. As defined by the European Commission, green finance within financial services entails investment strategies that integrate environmental, social, and governance (ESG) factors to ensure both customer satisfaction and societal well-being [21].

Amidst the burgeoning field of green finance, Inclusive Green Finance (IGF) emerges as a beacon of hope, illuminating a path towards a sustainable future. Zetzsche et al. [28] introduce a robust framework built on six pillars, meticulously designed to foster a vibrant green finance ecosystem. This architecture balances environmental responsibility with financial inclusion, recognizing that empowering individuals and communities is crucial for tackling pressing challenges like climate change and biodiversity loss. The "Strategy" block sets the foundation with a dedicated roadmap and consistent classification systems, ensuring clarity and direction for IGF implementation. "Prioritization" tackles potential resistance within financial institutions and regulatory bodies through education and engagement, while "Classification" establishes clear boundaries for IGF-compliant products and services, guiding responsible investment and lending. Data-driven decision-making takes center stage through the "Data & Models" pillar, equipped with specialized tools and integrated data flows. A thriving "Ecosystem" brims with expert services and technology providers, fueling innovation and market-driven solutions. Finally, the "Infrastructure" block forms the bedrock for secure transactions and financial services, laying the groundwork for universal access.

However, each pillar faces challenges like limited expertise and stakeholder reluctance. Zetzsche et al. [28] equip policymakers with five potent tools to overcome these hurdles: advocacy and education to raise awareness, voluntary standards to incentivize best practices, financial incentives to catalyze green lending, and when necessary, mandatory regulations to address market gaps and ensure compliance. Importantly, the framework acknowledges the unique challenges and priorities of each country, emphasizing the need for tailor-made solutions. This adaptable approach paves the way for Alliance for Financial Inclusion (AFI) member countries and beyond to achieve sustainable development by harmonizing their financial systems

with environmental responsibility, ensuring a future where economic progress thrives alongside ecological well-being. This notion gained traction during international meetings, notably the 2017 Sharm El Sheikh conference and its 2022 reaffirmation at the Dead Sea conference [28].

2.3 Green Banking

Positioned as a robust response to escalating environmental challenges, green banking (GB) transcends conventional financial transactions, embracing terms such as socially responsible and sustainable banking. This redefinition of the banking landscape prioritizes environmental preservation and resource protection alongside economic growth [29, 30]. Acknowledging the dual role of the banking sector—simultaneously driving economic progress through industrial funding and contributing to environmental concerns through emissions—GB serves as a critical bridge, fostering a paradigm shift within the banking system through responsible investment practices. By emphasizing green loans, integrating eco-friendly technologies into internal and external operations, and promoting environmentally and socially responsible investments, GB charts a course for sustainable development [31, 32].

Pioneered by the visionary Triodos Bank in 1980 [33], GB extends beyond financial transactions, embodying a proactive approach. It actively integrates green technologies to reduce carbon emissions, enhance environmental management, and mitigate the negative impacts of banking activities [31]. This proactive stance yields benefits not only for the planet, contributing to climate change mitigation and sustainable development [30] but also for the banking sector itself. Green banks, by showcasing their commitment to environmental responsibility, enhance their brand image and attract socially conscious customers, fostering a mutually beneficial scenario for both the environment and the financial world [34].

While some argue that financial development inherently leads to increased carbon emissions [35], studies suggest a potential for greener growth. Using econometric tools, researchers have found that specific measures of financial development, such as responsible lending practices and channeling funding towards green sectors, can decrease carbon emission intensity [36]. This underscores the importance of the direction and instruments employed in financial development for its environmental impact.

The growing momentum of green finance policies strengthens the case for GB. Central banks and national regulatory bodies are increasingly implementing mandatory requirements for banks to achieve green certifications, improve environmental credit scores, and demonstrate innovation and social inclusion [34]. These regulations are often complemented by tax benefits and other incentives for compliant banks, while intense competition within the sector fuels “mimetic pressure” to adopt successful green practices [36]. This dynamic interplay of regulatory pressure,

economic incentives, and competitive forces is propelling the exponential growth of green finance initiatives within the banking industry.

In conclusion, the diverse tapestry of research on green banking depicts its potential to address pressing environmental challenges. While financing sustainable projects remains a cornerstone, the literature explores innovative financial products, collaborative initiatives with local communities, and the crucial role of transparency and responsible regulations. Notably, the emphasis on empowering individuals and fostering grassroots adoption of green practices through microloans and accessible financial tools paints a promising future for widespread social and environmental impact [37]. Moving forward, further research exploring the long-term financial viability of green banking initiatives, alongside a continued focus on ethical considerations and equity in access to green finance, will be crucial to ensure its sustainable and impactful implementation. Ultimately, the burgeoning field of green banking offers a compelling alternative, weaving together economic development, environmental responsibility, and individual empowerment into a vibrant tapestry of a greener future.

2.4 Prominence of Green Banking

Green banking goes beyond being a mere buzzword; it represents a transformative force rewriting the script of the financial industry. It signifies a conscious shift towards integrating sustainability into the very fabric of how banks operate, where environmental responsibility becomes as essential as risk management. This integration safeguards not only the future of our planet but also the health of the financial system itself [33].

Banks serve as conduits of economic lifeblood. Through the embrace of green practices, they actively contribute to sustainable development, nurturing industries to grow not only in size but also in environmental responsibility. This proactive approach future-proofs their asset quality, minimizing risks and paving the way for long-term prosperity [30].

The benefits of green banking extend far beyond the balance sheet. It crafts a greener image for the bank, attracting environmentally conscious customers and investors. Green banking streamlines operations by reducing resource consumption, spanning from paper to energy to water. It enhances employee morale through eco-friendly workplaces and tech-empowered efficiency. Additionally, it mitigates risk by investing in renewable energy and sustainable ventures [3]. Green banking fosters environmental awareness through customer education programs, reducing the likelihood of non-performing assets due to unsustainable practices [25]. It promotes responsible lending that prioritizes green projects, further amplifying its positive impact.

Green banking isn't merely a checklist of technical upgrades like energy audits and carpools; it signifies a paradigm shift. It involves rewiring client behavior, promoting responsible consumption, and embracing innovation to build a financial future in

harmony with our planet. With stricter environmental regulations on the horizon, green banking isn't merely an option; it's an imperative. By consciously weaving this thread of sustainability into their operations, banks can transform from financial stewards to environmental champions, safeguarding both profits and the planet for generations to come [30].

3 The Palestinian Green Initiatives

In the complex context of Palestine, adopting the 17 UN SDGs promises a future woven with equity, resilience, and environmental harmony. However, one of them remains frayed: SDG 7, Affordable and Clean Energy. Despite electrification rates surpassing 99%, nearly 1.8 million Palestinians, mostly in Gaza strip, linger in the shadows, their lives dimmed by the lack of persistence of this fundamental necessity [38]. This energy deficit, not only impedes livelihoods but also fuels environmental challenges.

In this context, an important solution emerges—green banking. Imagine microloans empowering families to install rooftop solar panels, turning their homes into micro-powerhouses. Energy-efficient technologies, prompted by eco-friendly loans, leaving lighter consequences on the land and on the Palestinian economic opportunities, health, and competence [38].

In Palestine, green banking shapes a future where SDG 7 becomes a cornerstone of growth. A future where environmental responsibility and economic prosperity are not conflicting threads. By embracing this green future, Palestine can transform from a tapestry of challenges into an example of human ingenuity and environmental stewardship.

4 Green Banking in Palestine

Green banking in Palestine represents a significant step towards integrating environmental sustainability into the financial sector [39]. This encompasses initiatives like funding renewable energy projects, supporting eco-friendly ventures, and considering environmental criteria in investment decisions, aligning the sector's operations with environmental responsibility and contributing to regional sustainability efforts [40].

Despite these positive developments, there are notable challenges in quantifying the progress of green banking in Palestine [39]. A recent survey covering nine microfinance institutions and 13 banks in the West Bank and Gaza highlighted some critical insights [40]. According to the survey, a significant proportion of banks (62%) and microfinance institutions (44%) reported financing for green purposes, including solar energy and climate-smart agriculture. However, a major challenge lies in the inadequate technical capacity to assess and implement green finance projects, along

with a lack of specialized staff and a deficiency in bankable green projects. The survey further revealed that over 60% of financial institutions recognize the high to moderate risks posed by climate change to their clients. However, a striking 67% of microfinance institutions and 54% of banks do not incorporate these risks into their strategic planning. This indicates a gap in integrating climate-related risks into core financial strategies, compounded by the absence of technical tools, guidelines, and data [40].

In response to these challenges, the PMA is making commendable efforts, including the establishment of a comprehensive electronic database for green finance, set to launch in 2024. This database is expected to provide detailed information on all aspects of green finance, thereby addressing the current data gap [41].

Furthermore, there is a critical need for banking facilities and incentives specifically designed to promote green loans [33]. Implementing targeted banking facilities focusing on aspects like reduced interest rates and extended repayment periods could accelerate the adoption of green finance. Additionally, more than 80% of financial institutions agreed that establishing a dedicated green credit guarantee program could significantly increase the flows of green finance [40].

The banking sector's role in mobilizing climate finance is increasingly important, given the fiscal constraints in Palestine. As per the World Bank report, covering the financing needs identified would require about 50% of the banking sector's lending capacity. This necessitates a national strategy for greening the financial sector, with the PMA and Palestine Capital Market Authority (PCMA) playing key roles in developing this green finance ecosystem [40].

Despite the limited uptake of green finance, successful local initiatives demonstrate the effectiveness of combining financing with targeted technical assistance. Key opportunities include expanding green finance beyond solar energy to water management, clean-tech solutions, and nature-based tourism [40].

In summary, while green banking in Palestine is advancing, there are considerable challenges, including technical capacity, risk assessment, and the need for targeted banking facilities and incentives [39]. With initiatives like the upcoming comprehensive green finance database and the potential of a green credit guarantee program, there is a path forward to strengthen green banking practices in Palestine. However, significant efforts are required from financial institutions, regulatory bodies, and stakeholders to integrate environmental sustainability more deeply into the financial sector.

4.1 The Palestinian Monetary Authority Initiatives

The Palestinian Monetary Authority (PMA) has demonstrated leadership in enhancing economic resilience amidst various challenges, notably the COVID-19 pandemic and regional conflicts. The PMA's strategic response includes diverse funding initiatives to bolster the Palestinian economy.

In May 2020, the "Sustainability" program was launched by the PMA, featuring a $300 million fund focused on aiding small and medium-sized enterprises (SMEs) and microprojects affected by the pandemic's economic impacts. With $210 million directly provided by the PMA, this initiative channeled support through banks and specialized lending institutions to offer vital low-cost funding. This initiative was instrumental in sustaining affected businesses, including women-led projects, by providing accessible liquidity at nominal interest rates, thus facilitating extended economic stability [42].

Expanding its economic support, the PMA introduced the "Sustainability Plus+ (Istidama+)" fund in November 2023. With a substantial allocation of 500 million NIS, this fund targeted various sectors, particularly those suffering from war repercussions. It aimed to invigorate the market with necessary liquidity, aiding in the recovery and enduring financial sustainability of impacted enterprises. The "Sustainability Plus+" fund offered low-interest financing with accommodating repayment terms, including grace periods, effectively supporting key sectors like health, agriculture, renewable energy, and environmental conservation [42].

The "Sustainability Plus+" fund encompassed several programs, each tailored to specific recovery needs: aiding businesses in overcoming the effects of political and economic crises, supporting the health sector, enhancing agricultural initiatives, and funding renewable energy and environmental projects. The fund's comprehensive criteria ensured that beneficiaries were equipped with sustainable business models and contributed positively to national economic growth and sustainable development.

These PMA initiatives, through the "Sustainability" and "Sustainability Plus+" funds, underscore a multifaceted approach to tackle Palestine's economic challenges. Launched in May 2020 and November 2023, respectively, these programs signify the PMA's dedication to targeted financial support for critical sectors, enhancing resilience and contributing to broader regional economic stability. By focusing on essential areas like health, agriculture, and renewable energy, these programs resonate with the global move towards sustainable development and environmental conservation. The PMA's active role in deploying these funds illustrates a strategic pivot in using monetary policy instruments for promoting economic growth and stability, aligning with the Sustainable Development Goals.

4.2 SUNREF Program

Palestine's banking sector is witnessing a significant shift towards embracing sustainability and green energy initiatives, a change spearheaded by the SUNREF program. Developed by the French Development Agency (FDA) and backed by local Palestinian banks, the SUNREF program has been instrumental in promoting the adoption of renewable energy and energy efficiency solutions in Palestine, acknowledging the region's energy dependency and climate change vulnerability [43].

Initially, SUNREF Palestine, operational from 2017 to 2021, laid the groundwork with a €25 million credit line from FDA and an €8 million contribution from the

European Union. This support enabled partner banks to offer loans for green projects, encompassing renewable energies and energy efficiency. The program also provided investment premiums and technical assistance, strengthening the capacity of both the banks and the Palestinian Energy and Natural Resources Authority (PENRA) in identifying and assessing potential projects [43].

Building on the success of SUNREF I, SUNREF II was launched in collaboration with the Bank of Palestine and Cairo-Amman Bank, supported by Proparco and the European Union. This second phase, announced in March 2022, further elevates the scope of green finance in Palestine. SUNREF II combines a USD 30 million credit line from Proparco with EUR 11.5 million in technical assistance and premiums financed by the European Union. The program's focus on energy efficiency, a relatively nascent sector in Palestine, signifies a deepened commitment to green finance and SME development [44].

Nura Treish, Proparco's investment officer in Palestine, highlights that SUNREF II aims to facilitate investments in energy efficiency and renewable energy, particularly beneficial for Palestinian SMEs. The anticipated impact includes adding significant renewable energy generation and energy efficiency gains, benefiting a substantial number of users, primarily SMEs. The approach for SUNREF II involves extensive marketing and technical support to ensure the successful implementation and uptake of energy-efficient projects [44].

Additionally, as of December 2021, the project has taken a gender-sensitive approach, supporting the employment of women in the Bank of Palestine, which plays a significant role in executing SUNREF II. This aspect underscores the project's commitment to broader social and economic impacts, including job creation in the SMEs benefiting from the credit line [45–47].

In summary, the SUNREF program in its first and second phases, supported by entities like the FDA, the European Union, and Proparco, has established a robust framework for sustainable energy financing in Palestine. This initiative aligns with global environmental goals and demonstrates a strategic evolution in Palestine's banking sector, fostering a market for green investments and contributing to sustainable economic development.

5 Conclusion

This paper has profoundly analyzed the trends in green banking in Palestine that reveal a possibility of the integration of sustainable development with environmental responsibility. The PMA in combination with other stakeholders has been the centerpieces of this transformation, which has shown a dedication to move beyond regulation, but to governance as well as facilitation and encouragement of sustainable banking strategies.

The potential achievement of the environmental revolution by green banking is largely dependent on equity and inclusivity. Customized financial products and services, which address specific circumstances of the diverse population groups in

Palestine, must be part of the picture. This calls for stakeholder participation which comprises of capacity building of the PMA and the financial institutions as well as other stakeholders who are directly or indirectly involved. It is the crucial role of supervision by the PMA to set up a framework, develop internal expertise, and create supportive networks within the community.

The practical effects of these programs are immense. The creation of risk management tools, innovative marketing strategies and specialized training programs are the essential elements if the green banking paradigm is to be successfully adopted and thrived. Such efforts must be supported by the data-driven approach on the basis of which the corrective measures can be taken and tangible results obtained.

The study also deals with the challenges concerning implementing the green banks initiatives especially the insufficient data. The envisaged debuting of an in-depth green banking database in 2024 is the most crucial action to overcome this limitation. This database will not only offer important information on the state of the green banking currently, but also will help to conduct a thorough research and make prudent choices in the future.

Finally, the trip of green banking in Palestine, which has started with the initiatives of PMA and positively received by the financial community, demonstrates the way of green banking development based on sustainable and inclusive economic growth. Though there is still ground to cover, the continual efforts and forthcoming future developments will place Palestine as an influential example of green banking that is not only effective but also socially responsible. The sustainable development, fully in line with global environmental aims and Sustainable Development Goals, has great prospect to bring about a new type of economic development which also includes environmental care.

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The Role of Service Marketing Mix Elements in Achieving Healthcare Service Quality: Hospitals Patients as a Case Study

Zakaria Azzam and Manahi AlMaaytah

Abstract The objective of this study is to investigate the role of service marketing mix elements in the attainment of healthcare service quality. In order to achieve the study's objectives, a descriptive-analytical approach is employed. A questionnaire consisting of 51 items is utilized to collect data, which was distributed among 500 hospital patients in Al-Zarqa Governorate using a purposive sampling method. After excluding 105 incomplete or non-serious responses, a total of 395 valid responses are considered for analysis. The collected data is analyzed using appropriate statistical methods through the utilization of the SPSS program. The study yields several significant findings, indicating a statistically significant contribution of the healthcare service marketing mix elements (namely healthcare product, pricing, distribution, promotion, personnel (service providers), physical evidence, and processes) both collectively and individually in the achievement of healthcare service quality in hospitals within Al-Zarqa Governorate. Furthermore, the study reveals that these marketing mix elements are implemented to a high extent, with an average mean score of 3.79. Among the elements, the physical evidence variable obtains the highest mean score of 3.97 and is implemented to a high degree, while the personnel (service providers) variable obtains the lowest mean score of 3.60 and is implemented to a moderate degree. Additionally, the level of healthcare service quality implementation is found to be high, with an average mean score of 3.92. In light of the aforementioned discoveries, it is suggested by the study that government hospitals in Al-Zarqa Governorate concentrate on the advancement of healthcare services through regular campaigns aimed at reminding patients about the available hospital services. This is due to

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the evident influence of the promotional factor in enhancing the quality of healthcare services from the patients' perspective. Furthermore, government hospitals can address the challenge of distribution, which was found to have the least impact on healthcare service quality, by establishing geographically dispersed outpatient clinics that cater to all areas within Al-Zarqa Governorate. Additionally, the improvement of healthcare service delivery processes (operations) can be achieved by providing training to service providers in effective communication skills with patients.

Keywords Service marketing mix elements · Healthcare service quality · Government hospitals · Al-Zarqa Governorate · Jordan

1 Introduction

The success of organizations is influenced by numerous factors, and healthcare organizations hold significant importance within society. A key aspect that demands attention is the service component, which necessitates the integration of complementary elements. Service organizations of various types face considerable challenges in the field of marketing, which serves as a fundamental criterion for distinguishing between successful and unsuccessful organizations, as well as leaders within the service industry and their counterparts. Recognizing the significance of studying and implementing marketing strategies, many organizations have come to understand that their growth and sustainability hinge upon the development of effective marketing systems.

Despite facing various marketing challenges related to their services and beneficiaries, non-profit healthcare organizations have not received sufficient attention in terms of marketing strategies. This lack of focus often hampers their marketing efforts. Therefore, it is imperative to explore and implement concepts and methods that can effectively address these marketing issues and enhance the quality of services provided by these organizations [11]. The concept of marketing in the healthcare sector is multifaceted and encompasses elements such as product, pricing, distribution, promotion, physical evidence, processes, and personnel/healthcare providers. It is a complex concept that also intersects with areas like social marketing. While the healthcare sector draws inspiration from commercial marketing, the objectives pursued by service organizations set it apart [5].

Given the critical nature of the healthcare sector as it pertains to human life, the advancement of this sector to achieve exceptional medical services is a paramount objective for any organization [20]. Consequently, numerous organizations, including hospitals, strive to enhance the quality of their services in order to attain a level of excellence that satisfies both healthcare providers and patients. To improve their performance, these organizations employ various strategies, with an emphasis on quality as a significant approach that enables hospitals and other entities to deliver services that fully meet patients' desires, fulfill their requirements, and surpass their

expectations. As a result, quality emerges as a paramount concern for healthcare organization.

The Zarqa Governorate is distinguished by its notable population density and limited provision of public healthcare services. With an approximate population of 1.58 million individuals, Zarqa represents approximately 14% of the overall population of the Kingdom. Within the governorate, around 67% of the population possesses health insurance coverage, a figure that falls below the national average of 75.8% for insured individuals [12]. This situation prompts inquiries regarding the efficacy of the healthcare service marketing mix components in attaining the desired level of quality in healthcare services within government hospitals.

1.1 The Problem and Questions of the Study

In light of recent global changes in the healthcare industry, the significance of marketing for the survival and expansion of hospitals has significantly increased. However, there are numerous challenges that must be addressed, particularly when it comes to establishing small-scale hospital projects. The primary obstacle to their growth is the lack of sufficient cash flow to acquire high-quality healthcare resources. Healthcare marketing encompasses the provision of medical services to various user groups, ensuring their access to top-notch healthcare services. Several studies have highlighted a decline in the quality of services offered in the Hashemite Kingdom of Jordan, as demonstrated by the research conducted [3, 8–10, 19], resulting in a decrease in patient satisfaction, as indicated [1]. A drop in the use of healthcare service marketing mix elements is accountable for this dwindling rate and in turn has a negative impact on quality of services which affect patient satisfaction levels. The previous works have brought to light the significance of placing emphasis on marketing mix within health care organizations and gauging its effect on health care service quality. It is thus worth our while to explore this aspect given its role in Zarqa Governorate, highly populated with limited hospitals.

In light of the above, the problem of the study has emerged to investigate the role of elements of the healthcare service marketing mix in achieving healthcare service quality. The study questions can be formulated as follows:

- Primary Research Question: What is the role of elements of the healthcare service marketing mix in achieving healthcare service quality in hospitals in the Zarqa Governorate?

1.2 Study Model

Based on the findings of previous studies and making adjustments suitable for the current study, the study model has been designed as shown in Fig. 1.

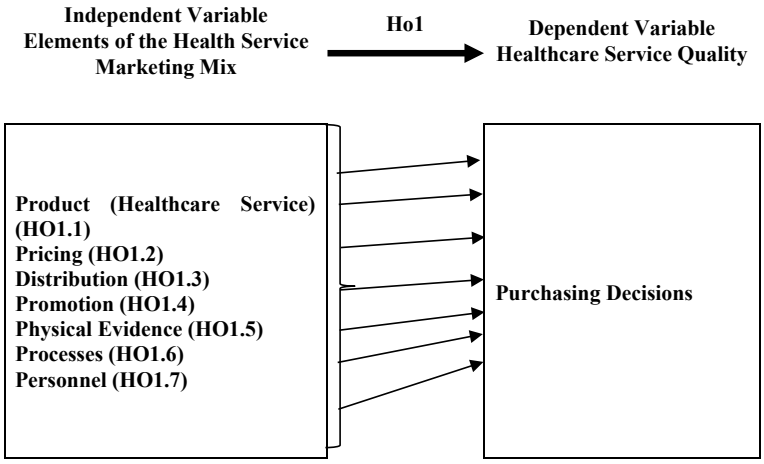


Fig. 1 Study model. *Source* [2–4, 6, 7, 15, 16, 22]

1.3 Study Hypotheses

Based on the research questions, the main hypothesis developed is as follows:

- H0: "There is no statistically significant role for the elements of the healthcare service marketing mix (Product (healthcare service), pricing of healthcare services, distribution of healthcare services, promotion of healthcare services, physical evidence, processes personnel (Service Providers)) in achieving the quality of healthcare services in hospitals in Zarqa Governorate."

From the main hypothesis, the following sub-hypotheses are derived:

- H0.1: "There is no statistically significant role for the healthcare service product provided in achieving the quality of healthcare services in hospitals in Zarqa Governorate."
- H0.2: "There is no statistically significant role for the pricing of healthcare service in achieving the quality of healthcare services in hospitals in Zarqa Governorate."
- H0.3: "There is no statistically significant role for the distribution of healthcare service in achieving the quality of healthcare services in hospitals in Zarqa Governorate."
- H0.4: "There is no statistically significant role for the promotion of healthcare service in achieving the quality of healthcare services in hospitals in Zarqa Governorate."
- H0.5: "There is no statistically significant role for physical evidence in achieving the quality of healthcare services in hospitals in Zarqa Governorate."
- H0.6: "There is no statistically significant role for service delivery processes in achieving the quality of healthcare services in hospitals in Zarqa Governorate."

- H0.7: "There is no statistically significant role for healthcare service providers (personnel) in achieving the quality of healthcare services in hospitals in Zarqa Governorate."

2 Theatrical Framework

2.1 Concept of Healthcare Service Marketing Mix

The healthcare service marketing mix, encompasses the analysis, planning, execution, and control of programs that aim to achieve optimal exchange value with target markets. The primary objective of healthcare organizations is to satisfy the needs and desires of these target markets, utilizing pricing, communication, and distribution strategies effectively. This, in turn, informs the market and creates motivation among individuals to seek and utilize healthcare services. Furthermore, the healthcare service marketing mix serves as a tool to assess the value, risks, and effectiveness of marketing efforts. It differs from primary and secondary research data, as it focuses on obtaining data to enhance organizational performance in the future, taking into account both past and present perspectives.

2.2 Importance of Healthcare Service Marketing Mix

According to [5], the significance of the healthcare service marketing mix became prominent during the 1980s due to the escalating cost of healthcare. This prompted researcher to focus on strategies to mitigate healthcare expenses. Consequently, healthcare organizations can benefit from employing marketing techniques to exert influence over costs and enhance the efficiency of specialized centers. Additionally, legislation mandating the evaluation of healthcare providers' performance has necessitated the provision of supporting information for additional services and resource allocation. The proliferation of medical facilities under diverse ownerships has further intensified interest in studying the healthcare service marketing mix.

2.3 Elements of Healthcare Service Marketing Mix

The marketing mix for both healthcare services and non-healthcare services encompasses seven essential components, as identified by reputable scholars such as [5, 8, 10, 11, 14, 13]. These elements include the product (service), pricing, distribution, promotion, physical evidence, processes, and personnel responsible for delivering the service. The following is a detailed explanation of these elements:

- **Healthcare Service (Product)**: The cornerstone of a successful marketing mix lies in the products themselves. Pricing, promotion, and distribution strategies that yield positive results are contingent upon the inherent qualities, features, functionalities, or advantages offered by the goods or services being marketed.
- **Pricing of Healthcare Service**: The aforementioned statement refers to a comprehensive management procedure that encompasses multiple factors in order to establish pricing for healthcare services.
- **Distribution of Healthcare Service**: According to [14], the selection of healthcare distribution channels is influenced by various factors, including the characteristics of the market, the type of healthcare services offered, the capabilities of the healthcare organization, the market position of the organization, legal obligations, and the electronic distribution of healthcare services. Direct distribution channels in the healthcare sector encompass public and private hospitals, medical clinics affiliated with hospitals, private physician clinics, home healthcare centers, care centers, and nursing homes. Indirect distribution channels within healthcare organizations may involve pharmacies, drug warehouses, and sales centers for medical devices and supplies.
- **Promotion of Healthcare Service**: The term encompasses a comprehensive range of endeavors and forms of communication with the primary objective of providing information and education to healthcare professionals, patients, and the general public regarding the classification and utilization of medications, the specific ailments or conditions for which they are designated, and the potential adverse effects associated with their usage.
- **Personnel (Healthcare Providers)**: The element being referred to in this context pertains to the collective group of individuals who are actively involved in delivering healthcare services to patients. These individuals, which encompass doctors, nurses, administrators, support service providers, and technicians, possess a significant degree of influence when it comes to the acceptance of these services by patients. Their primary objective is to establish a sense of belonging and loyalty between the patient and the healthcare organization through the provision of high-quality healthcare services. In order to ensure that patients are able to make informed decisions regarding their treatment and its potential risks, it is imperative for these individuals to assist patients in understanding and clarifying the nature and extent of the healthcare services being offered. This is particularly important due to the intangible and non-routine nature of healthcare services. Consequently, each medical case possesses its own unique characteristics and specifications, which are contingent upon the individual differences between patients.
- **Physical Evidence**: The concept of physical evidence in the context of healthcare services pertains to the tangible symbols or products utilized in the process of communication and delivery of these services [16]. Given the inherent intangibility of healthcare services, there is a need to imbue them with a certain level of tangibility through the use of various tools such as diagnostic and treatment equipment, clinical supplies, furniture, buildings, air conditioning, and other amenities provided by healthcare organizations. These elements play a crucial role in

creating a sense of comfort and satisfaction for patients, both during their actual receipt of healthcare services and in the period preceding and following it.

- **Processes**: According to the definition, processes encompass all activities and events that occur prior to and during the delivery of healthcare services, as well as the management of interactions between healthcare providers and recipients. The management of these processes commences from the moment the patient enters the healthcare facility, specifically in the reception area. The early perception of the quality of service provided is influenced by various factors, such as the accuracy of appointment scheduling, the promptness of response to healthcare requests, the manner in which healthcare professionals address and communicate with patients, the ability to deviate from routine tasks to acknowledge the patient's health condition, and the embodiment of human characteristics within the medical profession.

2.4 Quality of Healthcare Services

The quality of health care is a comprehensive definition according to the World Health Organization [21]. It refers not only to standard compliance and effectiveness in service delivery but also to safety as well as social acceptability plus cost benefit. Furthermore, it encompasses the impact of healthcare services on key health indicators such as morbidity, mortality, disability, and malnutrition. Procedurally, quality of healthcare services also involves ensuring the safety of both service providers and recipients. In the context of this study, the term refers to the range of practices implemented by hospitals in Zarqa Governorate, across all levels, with the ultimate goal of achieving optimal healthcare service provision to patients.

3 Study Methodology

The research methodology employed in this study is the descriptive-analytical method, chosen based on the nature of the study and the researchers' examination of prior research. The descriptive method is characterized as an approach that relies on comprehensive and precise information about a particular phenomenon or topic, gathered over established time periods, in order to derive practical outcomes that are objectively interpreted in accordance with the actual data of the phenomenon [18].

Table 1 Numbers of healthcare service beneficiaries in Zarqa Government Hospital and Prince Faisal Hospital

Hospital	Number of admissions	Percentage (%)
Zarqa Government Hospital	39,398	72
Prince Faisal Hospital	15,204	28
Total	54,602	100

Source Ministry of Health [12]

3.1 Study Population and Sample

The research encompasses the entire population of individuals residing in Zarqa Governorate who avail themselves of healthcare services, which amounts to approximately 1.58 million people. In line with Sekaran's and Bougie [18] recommendation that sample sizes in studies typically range from 30 to 500 participants, the survey instrument was distributed to 500 recipients of healthcare services in government hospitals within Zarqa Governorate. This was facilitated through the dissemination of an electronic link by the Public Relations Department of Zarqa Government Hospital and Prince Faisal Hospital, both of which are prominent healthcare facilities in the governorate. Table 1 provides an overview of the numbers of individuals benefiting from healthcare services at Zarqa Government Hospital and Prince Faisal Hospital in the year 2021.

A purposive sample, deemed suitable for the study, was employed, yielding a total of 467 responses. Following a thorough examination, it was determined that 72 responses lacked sufficient information for statistical analysis and were subsequently excluded. As a result, a total of 395 valid surveys were available for analysis, signifying a response rate of 79%.

3.2 Study Instrument

The construction of a measurement instrument to evaluate the impact of the elements constituting the marketing mix and service quality in the health care sector was preceded by no less than identification of related literature—[3, 16]. The survey instrument used in this study consists not just of one or two but three main dimensions.

3.3 Instrument Reliability

To ensure the reliability of the study instrument, Cronbach's alpha coefficient was computed for each axis of the study instrument and also for the total instrument. The results are presented in Table 5.

Table 2 Reliability of the study instrument

Axis	Number of items	Cronbach's alpha coefficient
Elements of healthcare service marketing mix	34	0.81
Healthcare service quality	12	0.78

Based on the data presented in Table 2, it can be concluded that the reliability coefficient of the test instrument axis is greater than 0.70 [17, 18]. Since the coefficient is higher than 0.7, it is confirmed that the instrument is valuable and can achieve the study's purpose, therefore it can be used. Using the research instrument was distributed to our participants to complete.

3.4 Internal Consistency Validity

Internal consistency reliability was used to validate the study instrument's reliability. A sample of 25 respondents, chosen randomly from both within and outside the study community, was administered the instrument. The correlation coefficient was then calculated between each statement's score and the total score of the instrument. The results are as shown in Tables 3 and 4.

By examining Table 3, it becomes apparent that there exists a positive correlation between all statements assessing the elements of the service marketing mix and the overall score of the axis. This correlation suggests that these statements effectively measure the intended constructs within this axis.

Based on the data presented in Table 4, it is evident that there exists a positive correlation between all the statements assessing the healthcare service quality axis and the overall score of the said axis. This correlation indicates that the statements effectively measure the intended aspects within this particular axis.

3.5 Descriptive Analysis of the Study Sample

The characteristics and personal information of the study sample were identified, including gender, age, employment sector, income, health insurance availability. Table 5 illustrates the frequencies and percentages describing the personal information of the study sample.

The distribution of gender within the study sample, as depicted in Table 5, reveals that males accounted for 53.2% of the participants, while females constituted 46.8%. This balanced distribution signifies a commendable inclusivity within the sample. Moreover, the study highlights that individuals belonging to the age group of 30 to less than 40 years represented the largest proportion (31.6%) of the sample, thereby

Table 3 Internal consistency reliability of the study instrument: service marketing mix elements

Variable	M	Statement	Correlation
Product (services)	1	The hospital provides quality services to resident patients	796
	2	The hospital provides quality services to visitors	747
	3	The hospital provides diverse healthcare services in all specialties	816
	4	The hospital prioritizes the benefit of patients above all considerations	789
	5	The hospital provides sufficient information about its diverse healthcare services to patients	762
Pricing	6	The hospital clarifies its prices for visitors	763
	7	Prices are used to influence patients' choice of treatment at the hospital	820
	8	Prices of hospital services are tailored to the segments it serves	826
	9	The hospital aims to provide healthcare services regardless of the patient's financial ability	729
Distribution	10	The outpatient clinic location of the hospital is attractive	722
	11	The hospital's location is easily accessible	877
	12	All necessary equipment is available in hospital rooms	906
	13	Working hours are suitable for patients	869
	14	The hospital has a website providing all necessary information for patients	873
	15	The hospital provides its healthcare services around the clock	864
Promotion	16	Advertisements are used to introduce the healthcare services offered by the hospital	892
	17	There is a public relations department at the hospital	896
	18	The hospital cares about building a good reputation among the target audience	872
	19	The hospital offers incentive discounts to visitors	915
	20	Healthcare services offered by the hospital can be identified through available promotional media	895
Physical evidence	21	The hospital emphasizes general cleanliness	899

(continued)

Table 3 (continued)

Variable	M	Statement	Correlation
	22	Directional signs are available in hospital corridors and halls	896
	23	The hospital provides parking spaces for visitors' cars	900
	24	The hospital provides food and beverage services for visitors	880
Processes (procedures)	25	Employees strive to provide accurate service from the first instance	892
	26	Patient inquiries and complaints are dealt with transparently	0.897
	27	Hospital services rely on speed	0.833
	28	Hospital services rely on accuracy	0.894
	29	The hospital ensures fairness in dealing with all segments of the community	0.899
Personnel	30	Employees are hired at the hospital based on skill	858
	31	Employees are hired at the hospital based on experience	0.904
	32	Hospital employees receive sufficient training on dealing with patients	917
	33	Employees strive to provide the best they have for patients	889
	34	Hospital employees possess communication and interpersonal skills	0.910

Table 4 Internal consistency reliability of the study instrument: healthcare service quality

M	Statement	Correlation
35	Patients trust the capabilities of hospital staff	0.833
36	The hospital provides sufficient guarantees to confirm the capabilities of its staff, enhancing service quality	0.894
37	Doctors at the hospital have sufficient authority to perform their duties, enhancing service quality	0.899
38	Patient needs are easily met, enhancing service quality	858
39	Patient inquiries and suggestions are responded to within a specified period	0.904
40	The hospital enjoys a good reputation	917
41	The hospital cares about all patient details	889
42	The hospital seeks to provide high-quality healthcare services	0.910
43	Hospital prices are commensurate with the quality of service provided	0.897
44	Employees strive to achieve the hospital's goals	0.844
45	The hospital ensures the mental health of patients	0.901
46	The hospital ensures the physical health of patients	0.854

Table 5 Personal information of the study sample

Item	Statement	Frequency	Percentage (%)
Gender	Male	210	53.2
	Female	851	46.8
	Total	395	100.0
Age	Less than 20 years	36	9.1
	20—less than 30 years	78	19.7
	30—less than 40 years	125	31.6
	40—less than 50 years	112	28.4
	50 years and above	44	11.1
	Total	395	100.0
Employment Sector	Public sector	217	54.9
	Private sector	65	16.5
	Self-employed	35	8.9
	Student	46	11.6
	Unemployed	17	4.3
	Other	15	3.8
	Total	395	100.0
Income	260–500	195	49.4
	501–750	123	31.1
	751–1000	45	11.4
	1001 and above	32	8.1
	Total	395	100.0
Health Insurance	Insured	236	59.7
	Not insured	159	40.3
	Total	395	100.0

indicating the youthful composition of the Jordanian society. Additionally, the findings demonstrate that 54.9% of the participants were employed in the public sector. This can be attributed to the comprehensive health insurance coverage provided by the government to all public sector employees and their families.

Furthermore, it was found that a significant proportion (49.4%) of the participants in the study had a monthly income below (500) Jordanian Dinars, indicating the relatively low salary levels within this particular sector. Additionally, the findings indicate that a majority (59.7%) of the participants in the study possessed health insurance, which is consistent with the nature of their employment. This can be attributed to the fact that government-provided health insurance extends coverage to employees and their dependents within the public sector.

The study considers the above results indicative of the diversity and inclusivity of the study sample, which may contribute to the ability to generalize its findings.

3.6 Study Results and Testing of Hypotheses

- Primary Research Question: What is the role of elements of the health service marketing mix in achieving the quality of healthcare services in hospitals in Zarqa Governorate?

The resolution to this inquiry can be found through the examination of the primary hypothesis of the research (H01): The elements comprising the health service marketing mix (healthcare product, healthcare service pricing, healthcare service distribution, healthcare service promotion, Personnel (healthcare service providers), physical evidence, processes) do not play a statistically significant role in the attainment of healthcare service quality in hospitals located in Zarqa Governorate.

The study utilized multiple linear regression analysis to test this hypothesis, and Table 6 illustrates the test results:

Based on the findings presented in Table 6, it can be observed that the value of F was recorded as 53.803, with a significance level of 0.00, which is below the predetermined significance level of 0.05. This outcome leads to the rejection of the null hypothesis, which suggests that there is no statistically significant relationship between the elements of the health service marketing mix and the quality of healthcare services in hospitals within Zarqa Governorate. Conversely, the alternative hypothesis is accepted, indicating that there is indeed a statistically significant association between the elements of the health service marketing mix and the achievement of high-quality healthcare services in hospitals located in Zarqa Governorate.

Moreover, the analysis conducted based on Table 6 established the significant influence of the independent variables, namely the components of the health service marketing mix (healthcare product, healthcare service pricing, healthcare service distribution, healthcare service promotion, Personnel, physical evidence, processes), in their combined effect on attaining the desired quality of healthcare services in

Table 6 Multiple linear regression analysis

Dependent variable	R	R^2	F	Significance	Independent variable	B	T	Significance
Quality of healthcare services	0.702	0.493	53.803	0.00	Healthcare Product	0.155	5.463	0.000
					Pricing	0.207	− 3.047	0.002
					Distribution	0.925	4.333	0.000
					Promotion	1.133	10.099	0.000
					Physical evidence	0.371	4.902	0.000
					Processes	0.795	− 4.177	0.000
					Personnel (healthcare service providers)	0.929	− 7.439	0.00

hospitals located in Zarqa Governorate. These elements collectively accounted for a substantial proportion (49.3%) of the observed variations in the quality of healthcare services within the aforementioned hospitals.

3.7 Results of Stepwise Linear Regression Analysis

Following the completion of the study's questionnaires and hypothesis testing, a stepwise linear regression analysis was employed to ascertain the most effective independent variables in elucidating the fluctuations within the dependent variable, ranked in order of decreasing significance. The results are presented in Table 7.

The stepwise linear regression analysis presented in Table 7 elucidates the relationship between independent variables and healthcare service quality. The analysis resulted in five models, each ranked according to the strength of their influence on healthcare service quality. The first model demonstrates that healthcare service

Table 7 Stepwise linear regression analysis

Model	Independent variable(s)	B	R	R^2	F	Significance
1	Healthcare service promotion	0.439	0.545	0.297	165.786	0.00
2	Healthcare service promotion Personnel (service providers)	0.981 − 0.523	0.620	0.385	122.524	0.00
3	Healthcare service promotion Personnel (service providers) Physical evidence	0.844 − 0.492 0.218	0.655	0.428	97.714	0.00
4	Healthcare service promotion Personnel (service providers) Physical evidence Healthcare service product	0.875 − 0.545 0.198 0.122	0.457	82.099	0.00	
5	Healthcare service promotion Personnel (service providers) Physical evidence Healthcare service product Pricing	0.805 − 0.493 0.385 0.153 − 0.199		0.468	68.544	0.00

promotion accounts for 29.7% of the variations in healthcare service quality. In the second model, the variable of Personnel (healthcare service providers) is introduced, leading to an increase in the explanation of variations to 38.5%. The third model incorporates the variable of physical evidence, further increasing the explanation of variations to 42.8%. The fourth model includes the healthcare service product variable, resulting in an explanation of variations of 45.7%. Finally, the fifth model incorporates the pricing evidence variable, leading to an explanation of variations of 46.8% in healthcare service quality.

The software utilized in this study excluded the variables of distribution and processes due to their perceived lower explanatory power for the dependent variable. Nevertheless, it is important to note that these variables still have an impact on healthcare service quality, as demonstrated by the results of simple regression equations. However, it should be acknowledged that the influence of these variables diminishes when other independent variables are taken into consideration.

3.8 Study Results Summary

- Elements of the health services marketing mix (product, pricing, distribution, promotion, personnel, physical evidence, processes) play a statistically significant role in achieving the quality of health services in hospitals in Zarqa Governorate.
- Elements of the health services marketing mix are used to a high extent with an average score of (3.79).
- There is a statistically significant role of health services in playing an important role in achieving the quality of health services in hospitals in Zarqa Governorate.
- The variable (health product-service) received an average score (3.89) and is used to a high degree.
- Prices of health services play a statistically significant role in achieving the quality of health services in hospitals in Zarqa Governorate.
- The variable (prices) received an average score (3.91) and is used to a high degree.
- The distribution of health services plays a statistically significant role in achieving the quality of health services in hospitals in Zarqa Governorate.
- The variable (distribution) received an average score (3.65) and is used moderately.
- Promoting health services in achieving the quality of health services in hospitals in Zarqa Governorate plays a statistically significant role.
- The variable (promotion) received an average score (3.75) and is used to a high degree.
- Physical evidence of health service delivery plays a statistically significant role in achieving quality health services in hospitals in Zarqa Governorate.
- The variable (physical evidence) had the highest mean score (3.97) and is used to a high degree.
- Health service delivery processes play a statistically significant role in achieving quality health services in hospitals in Zarqa Governorate.

- The variable (processes) received an average score (3.71) and is used to a high degree.
- There is a statistically significant role of health service providers (individuals) in achieving quality health services in hospitals in Zarqa Governorate.
- The variable personnel (Service Providers) received the lowest mean score (3.60) and is used moderately.
- The level of application of the quality of health services is high and amounts to an average of (3.92).
- The results of the stepwise linear regression analysis showed (5) models explaining changes in the quality of health services, ranked according to the strongest influence of the independent variable, with the first model showing that promoting health services explains (29.7%) changes in the quality of health services, while in the second model, a personnel (Service Providers) variable was added to determine the amount of explanation for changes in the quality of health services (38.5%), and in the third model, a physical evidence variable was added to explain changes in the quality of health services (42.8%).

4 Discussion of Results

The findings of the study revealed that the elements of the health service marketing mix, including healthcare product, pricing, distribution, promotion, personnel (service providers), physical evidence, and processes, collectively and individually play a statistically significant role in achieving health service quality in hospitals in Zarqa Governorate. These elements accounted for 49.3% of the variations in health service quality in the aforementioned hospitals. Furthermore, it was found that the elements of the health service marketing mix are implemented to a high extent, and the level of health service quality implementation is also high. The findings of this study align with previous research conducted [11], discovered a reciprocal relationship between health marketing and health service quality. Conversely, [1] explored the perceived quality of health care as the independent variable, with patient satisfaction and loyalty as dependent variables. Specifically focused on the role of social marketing, while investigated the impact of digital marketing strategies on international patient satisfaction. Additionally, [3] conducted a study to analyze the influence of health service quality on patient satisfaction in hospitals.

4.1 Recommendations

Based on the results of the study, the following recommendations are made:

- Hospitals in Zarqa Governorate should focus on promoting health services through periodic campaigns reminding patients about hospital services, given the clear

impact of variable promotion on improving the quality of health services from the patients' perspective.
- Hospitals can overcome the problem of distribution, which from the patients' point of view was one of the variables that had the least impact on the quality of health services, by opening geographically dispersed clinics covering all areas of Zarqa Governorate.
- Improving the service provision process(es) by subjecting service providers to training in communication skills with patients.
- Providing the necessary infrastructure to enhance physical evidence by ensuring hospital cleanliness, providing comfortable seating and waiting areas, placing directional signs in hospital corridors and lobbies, and using modern medical equipment.
- Ensuring the service is performed correctly the first time.
- Giving hospital staff appropriate authorizations to perform their duties.

4.2 Future Study Proposals

The current study proposes the following studies:

- Using the instruments of this study and applying them to other government service organizations, such as the General Revenue Office.
- Studying the impact of digital marketing elements on service quality in government hospitals in Zarqa Governorate.

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The Reality of Field Training for Social Work Students at University



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Abstract The study aimed to identify the reality of field training for social work students at the Al-Quds Open University—Bethlehem Branch. The study followed the quantitative approach, and the study sample consisted of a random sample of 41 male and 55 female students majoring in social work at the Al-Quds Open University—Bethlehem Branch. The study relied on a questionnaire tool, and the study found that the most important aspects of the institution where the student trains are providing an opportunity to participate in the social events of the institution, and the most important aspects of the institution providing an opportunity to participate in the social occasions of its employees. The problems and difficulties facing social work students are the lack of material resources necessary for training, and the problems and difficulties facing social work students are the duality of messages from the institution's supervisor and the university supervisor.

Keywords Field training · Social work · Human capital theory

1 Introduction

The education and preparation of social workers occupy theoretically and practically a prominent place among the concerns of those involved in social work education to localize the profession and increase its societal recognition in Palestinian society. Social work is a profession that is offered to individuals, groups, and communities with the aim of assisting them to contribute to improving their economic, social, and political well-being, and helping them to perform their roles in social reform.

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Therefore, its integrated scientific base of knowledge derived from social, behavioral, medical sciences, technical methods, skills, techniques, objectives, and ethical standards makes its practitioners in need of special preparation. Thus, professional practice requires theoretical frameworks to guide it; it also requires skill in application. The purpose of social work education is to prepare specialists to practice the profession at a high level of proficiency. However, the professional preparation of social workers occupies a leading position in the list of problems facing the professional practice of social work. Stakeholders in the preparation of social workers agree on the necessity of professional preparation, considering it the professional practitioner of social work, its real interface, and the tool that sets its goals, principles, and implementation into action. The success of social work depends on the success of professional preparation; therefore, professional preparation of social workers represents the backbone of social work practice because it aspires to professional role practice, fulfilling the duties and responsibilities required by the movement of change [1–16].

This can only be achieved through field training, as it represents one of the important pillars in preparing social workers, as it is a technical process through which experience, skills, flexibility, and the ability to confront various professional practice situations are gained. Field training in the field of social work preparation is the cornerstone of the social work education process, as the preparation process contributes effectively through the practical training programs followed to develop the professional personality of male and female students at Al-Quds Open University in the Bethlehem region.

The importance of field training in social work has been highlighted since ancient times, since the inception of social work. Social aids provided through the social dispensary's movement (1869) and through charity organizations (1877) were not based on scientific foundations due to their simplicity on the one hand and their scarcity or limitation on the other hand. However, all of this was successful until those aids became official systems in line with the development of human life and the development of social care activities (aids), and the emergence of social work as a humanitarian profession with its values, principles, ethics, and skills [17–26].

The beginnings of social work education were training courses that focused on methods of researching client cases, then training on report and record writing. However, this method did not suffice without theoretical education, prompting those interested in social work to lay down theoretical foundations to aid in a deeper understanding of human problems, social systems, and the nature of human personality components. With the development of social work in various practice fields and theoretical aspects, social work education has become what it is now: theoretical education and practical training [3, 27–35].

Study Problem:

The problem of the study revolves around the following question: What is the reality of field training for social work students Al-Quds Open University in the Bethlehem region?

Study Objectives:

- To understand the reality of field training for social work Al-Quds Open University in the Bethlehem region.
- To identify the institutions practicing social work.
- To identify the problems and challenges facing social work students.
- To explore students' proposals for addressing field training difficulties.
- To recognize the most important skills acquired by social work students during field training.

Study Importance:

The importance of the study lies in shedding light on the reality of field training Al-Quds Open University, particularly in the Bethlehem region, as training plays a crucial role in shaping the trainee's personality and acquiring skills and principles for scientific practice. It is necessary to understand the reality of field training, problems, and challenges to address them and achieve a high level of training.

2 Study Methodology

This study relies on using the descriptive-analytical method, which attempts to describe the research subject phenomenon and interpret, compare, and evaluate it in order to reach useful generalizations that increase knowledge about the research subject phenomenon. The study starts from the present to the past to extract lessons and insights, diagnosing strengths and weaknesses to strengthen all aspects of strength and confront weaknesses. It also projects from the present to the future, attempting to derive predictions from the study's reality and decisions regarding it in subsequent stages.

First: Study Population The study population consists of male and female students majoring in social work at Al-Quds Open University, Bethlehem branch.
Second: Study Sample Based on the study population, the study sample consisted of a random sample comprising 41 male students and 55 female students majoring in social work at Al-Quds Open University, Bethlehem branch. The training locations were in civil and governmental centers and institutions in the Bethlehem Governorate.
Third: Study Tool To accomplish the study's tasks and achieve its objectives, information was collected using a questionnaire as the primary source of data collection. The questionnaire was prepared, its sections formulated, and then distributed to the study sample.
Fifth: Study Tool Reliability The reliability of the study tool was verified by examining the internal consistency of the tool's items by calculating the Cronbach's Alpha coefficient on the entire study sample, where the reliability value was (0.93). Thus, the tool enjoys a very high degree of reliability.

3 Results

First: Answering the Study Questions.

First Study Question: What is the extent of the reality of field training for social work students at Al-Quds Open University?

To answer the above question, the numbers, means, and standard deviations of the field training reality for social work students at Al-Quds Open University were extracted based on the total score of the scale.

The reality of field training for social work students at Al-Quds Open University was significant, with the mean score for this degree on the study scale being (4.07), with a standard deviation of (0.36).

Second Study Question: What are the most important aspects of the institution where I train?

To answer the previous question, the means and standard deviations of the most important aspects of the institution where I train were extracted, ranked by importance.

The degree of the institution where I train was moderate, with the mean score for this degree being (3.17). The most common aspects were the opportunity to participate in social events at the institution, followed by the opportunity to participate in social occasions with its employees.

Third Study Question: What are the most important aspects of the problems and challenges facing social work students?

To answer the previous question, the means and standard deviations of the most important aspects of the problems and challenges facing social work students were extracted, ranked by importance.

The degree of the problems and challenges facing social work students was moderate, with the mean score for this degree being (2.97). The most common aspects were insufficient financial resources for training, followed by the lack of seriousness from trainees to benefit from training, and the duplication of messages from the institution's supervisor and the university supervisor.

Fourth Study Question: What are the most important aspects of the reality of field training?

To answer the previous question, the means and standard deviations of the most important aspects of the reality of field training were extracted, ranked by importance.

The degree of the reality of field training was significant, with the mean score for this degree being (3.57). The most common aspects were supervisors assigning trainees to write reports, followed by organizing field visits to social institutions, and then coordinating with the institution by the supervisor.

Secondly: Testing the hypotheses:

Hypothesis 1: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University

attributed to the gender variable. No statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the gender variable.

Hypothesis 2: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the age variable. No statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the age variable.

Hypothesis 3: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the academic year variable. Statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the academic year variable. To identify the source of these differences, a Tukey test was conducted for pairwise comparisons in the field training degree of Social Work students at Al-Quds Open University attributed to the academic year variable. The differences in the field training degree of Social Work students at Al-Quds Open University are attributed to the academic year, favoring first-year students over fourth-year students, where the field training degree was the highest for fourth-year students.

Hypothesis 4: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the type of training variable. No statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the type of training variable.

Hypothesis 5: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the supervisor's position in the institution variable. Statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the supervisor's position in the institution variable. To identify the source of these differences, a Tukey test was conducted for pairwise comparisons in the field training degree of Social Work students at Al-Quds Open University attributed to the supervisor's position in the institution variable. The differences in the field training degree of Social Work students at Al-Quds Open University are attributed to the supervisors position in the institution, favoring directors over coordinators, with the highest field training degree observed for students whose supervisor was a director.

Hypothesis 6: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the number of training days in the institution variable. Statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the number of training days in the institution variable. To identify the source of these differences, a Tukey test was conducted for pairwise comparisons in the field training degree of Social Work students at Al-Quds Open University attributed to the number of training days in the institution variable. The differences in the field training degree of

Social Work students at Al-Quds Open University are attributed to the number of training days in the institution, favoring students with two training days per week over those with three days per week, with the highest field training degree observed for students with two days of training per week.

Hypothesis 7: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the number of weekly training hours in the institution variable. Statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the number of weekly training hours in the institution variable. To identify the source of these differences, a Tukey test was conducted for pairwise comparisons in the field training degree of Social Work students at Al-Quds Open University attributed to the number of weekly training hours in the institution variable. The differences in the field training degree of Social Work students at Al-Quds Open University are attributed to the number of weekly training hours in the institution, favoring students with fewer than 5 training hours over those with 8–12 h, with the highest field training degree observed for students with fewer than 5 h of training.

Hypothesis 8: There are no statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the type of institution variable. Statistically significant differences at the $\alpha = 0.05$ level in the field training degree of Social Work students at Al-Quds Open University attributed to the type of institution variable. The differences favored secondary institutions, with the highest field training degree observed for students at secondary institutions (mean = 4.24) compared to primary institutions (mean = 3.98).

4 Conclusion

Key aspects of the institution where students undergo field training include providing opportunities for participation in social events within the institution and allowing participation in social occasions for the staff. The problems and challenges facing social work students include insufficient financial resources necessary for training and the dual messages from the institutional supervisor and the academic supervisor.

5 Recommendations

1 Increase attention to and clarify for students about field training institutions through lectures and workshops on the importance of benefiting from the field training period for their own benefit and advantage.

2 Understand individual differences among trainees and consider their abilities and circumstances in line with the nature of the activities practiced in the training institutions they are directed to.
3 Take into account the interests and preferences of students in choosing the field training institution, considering the proximity or distance of the institution to the trainees, which contributes to creating motivation to perform training tasks and attend regularly.
4 Understand the circumstances under which training takes place and recognize the factors that contribute to the success of training and development efforts, as well as those that hinder their effectiveness in imparting appropriate skills to students.
5 Develop professional models illustrating how to assist students in acquiring professional skills in social work, designed collaboratively by academics, practitioners, and training supervisors, to be used during the supervision process in field training.
6 Develop a joint action plan between the academic supervisor and the institutional supervisor for field training, strengthening positive relationships between college supervisors and the institution, resulting in a flexible plan that enables students to gain the necessary professional experience for proper professional practice after graduation.
7 Establish a predefined timeline for visits and supervision meetings between the college supervisor and trainee students from the beginning of the field training period, facilitating preparation for such supervisory meetings.

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The Role of Language as Soft Power in International Relations: Analyzing Diplomatic Discourse and Public Communication Strategies



Aref A. Murshed, Aladdin Tarawneh, and Mohammed Al-Badawi

Abstract In the realm of international relations, the complexities that govern the interaction between language and soft power have risen to prominence, playing a significant role in shaping the intricate network of global connections. This extensive study aims to uncover the subtle and diverse aspects of language as a malleable tool of soft power, with a particular focus on its manifestations in diplomatic discourse and strategies for public communication. The research objectives are designed to cover a comprehensive exploration, delving into theoretical frameworks, conducting thorough analysis of diplomatic discourse, examining the intricacies of public communication strategies, and scrutinizing case studies from the real world. In this extensive research, the study aims to explore how nations use language to shape perceptions, form alliances, and have a significant cultural impact on the global stage. The well-thought-out methodology takes a qualitative approach, using detailed descriptive and analytical frameworks to carefully examine the subtle linguistic aspects found in diplomatic conversations and public communication. Real-life examples, such as the well-known Alliance Française and the widely spread Confucius Institutes in China, act as clear examples, vividly demonstrating the practical effects and complexities related to language-based influence. Ending with a thoughtful conclusion, the study emphasizes the importance of having a nuanced and ethical approach when using language for influential purposes, skillfully acknowledging and navigating through the intricate difficulties, obstacles, and possible outcomes that are deeply intertwined with the power of language in the ever-changing world of international diplomacy.

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Keywords Language · Soft power · International relations · Diplomatic discourse · Public communication strategies · Rhetorical analysis · Case studies · Alliance Française

1 Introduction

In the complex and ever-changing world of international relations, the concept of power goes beyond just military strength and economic might. Soft power, a term coined by Joseph Nye in the later part of the twentieth century, has become an essential tool for nations that wish to expand their influence beyond traditional power dynamics [20]. At a time when international interactions are intensifying and diversifying, this analysis intends to contribute new perspectives of how soft power circulates and develops, offering particular attention to the multiplicity and specificity of language in international relations.

Soft power, as defined by Nye, is a transition from hard power conventions. The use of attraction and persuasion, rather than force and money, to get others to appreciate a country's values, merge interests, and follow its leadership—that's soft power. The allure of a nation's culture, values and its communications and public diplomacy strategies frame and guide the process of using soft power. In short, soft power is the psychological and cultural dimension that gives a nation an edge in power relations. While military hard power and economic hard power are important, soft power alludes to the deeper and more persuasive elements of a country's influence abroad or, as Nye [1] defined it, cultural attraction generated by the 'raw materials' of described civilization [17].

Language becomes that incredible humble yet very powerful basis for soft power, a medium through which the sweeping expressions of a nation are formulated, a true vessel for the principles that the countries embody, and well as the communication of the objectives they portray to the entire world. Then there's the delicate nuance of diplomatic discourse, public addresses and media interactions that surely account for the way that the International community sees things, and for the diplomatic ties valued above things beyond empty words that are formed as a result. Times now are more interconnected than ever before. If anything, we can't afford to understate the significance of the synergies that governments worldwide ride on in an effort to use effective communication practices to excel in language in establishing the desired soft power public standing. Data compiled by the Chatham House, a renowned think tank based in London, shows that countries that have a strategy in place also get unique opportunities to leverage effective language in establishing their soft power ranking with international audiences [11, 12].

1.1 Importance of the Study

This is a particularly significant study, helping us to understand the complex, multi-faceted concept of linguistic soft power in international relations. Taking place in a world that is more interconnected than ever and still facing numerous complex problems, enhanced insight into how nations manipulate and manage language to convey and create an impact holds great importance for policymakers, diplomats and scholars. Accordingly, the findings could potentially help policymakers and diplomats gain a deeper and more nuanced understanding of how language shapes perceptions, forms alliances and acts as an alternative channel for promoting national interests. The study of the applied techniques and treatments in diplomatic negotiations and public communication adds to the academic discourse on soft power and extends the existing theoretical understandings and our ability to comprehend the ways in which countries seek to influence the world around them without using force. The findings of this study could therefore be applied to help those pursuing national interests on the global stage; for example, in crafting better communication strategies and diplomatic tactics. The outcomes thus hold a great deal of importance not just for academic purposes but also in offering more effective guidance for the practitioners and policymakers engaged in an ongoing ambitious process of state building in order to create a better world for all..

1.2 Research Objective

In this ambitious research endeavor, we seek to approach a thorough analysis of the complex role that language in its formal sense plays as an instrument of soft power in complex international relations. A closer look at aspects of diplomatic discourse and the strategies countries adopt in public communication will allow us to trace how language intricately contributes to the phenomenon of soft power. In doing so, our goal is not only to identify the superficial characteristics of a successful—or not successful—linguistic soft power phenomenon, but also to uncover the human, technical and political mechanisms behind it. High-quality research implies a virtuous circle of influence in international diplomacy. Our intention, therefore, is to provide the field with a modern and nuanced understanding of the intricate relationship between language and soft power in international relations. We will do this by analyzing specific cases in detail, drawing on a solid theoretical framework and specific developments in the field.

1.3 Methodology

In this study, we decided to use qualitative methods to explore this question with as much precision as possible: how does the soft power of language shape itself in international relations? And who shapes it? This question is difficult to answer because diplomatic discourse and public communication are typically complex and nuanced. Therefore, in order to drill down into details, we must use qualitative methods: through data quality and descriptive analysis. We will therefore look at a range of public communications between nations, examining the language different countries use in their diplomatic speeches, public communications campaigns and media messages. We will look at how language is used as a tool of soft power and to what effect. Specifically, in this article we will use descriptive analysis to examine the main elements of the language used—vocabulary, words or artifacts that are manipulated (called topoi if they are nonverbal), metaphors, symbols, and other rhetorical elements. Characters and all linguistic norms (spoken and written) used in diplomatic speeches, public communication campaigns and media strategies of various nations. Analytical analysis methods will be used to analyze descriptive data to identify clusters or patterns, recognize the actors and contexts in which language-based soft power appears to be operating or not, and identify the general conclusions that can be drawn from the data. Generally speaking, we use qualitative methods to analyze this data in detail, which is an infinitely more worthy goal than rough or quantitative analysis. Using qualitative methods, we can begin to describe the complex and dynamic phenomenon that is language-based soft power in international relations, with all its implications and the interdependence it deserves. In turn, the analysis is conducted within an analytical framework that aims to extract knowledge from qualitative data and thereby contribute to a deeper understanding of the international language-based soft power domain.

2 Literature Review

If we look at the evolving landscape of international relations, language has quickly risen to the top of the list of emerging factors in soft power thinking. Scholars have confirmed its central importance. Nye's [1, 20] seminal work on extending and extending the essentialist ideas surrounding this idea has helped to create a new desideratum for unraveling the elusive concept while drawing our attention to soft, non-coercive influence through culture, value, and political means. In recent years, scholars have consistently begun to uncover the specific ways in which language contributes to the broader soft power ecosystem.

As Johnson [14] shows, her scholarly approach to broadly understood diplomatic communication begins with in-depth research on the role of language in constructing (and often manipulating) world opinion: through detailed case studies, she discovers

the ways (sometimes subtle, sometimes very overt) which states use strategic rhetorical expression to convey diplomatic messages and their profound impact on the course of international affairs. On the other hand, Smith's [21] study on "performance" in public communication examines how countries use their ability to use language in their speeches to effectively project their power through "performance strategies." Smith argues persuasively that the reception of a speech often depends on linguistic achievement as much, if not more, than on its discursive content.

Their groundbreaking study (2022) clearly demonstrates, with empirical evidence of concrete examples, how new diplomatic discourse shapes and is shaped by social media, with Twitter and Facebook becoming apparatuses for disseminating soft power in the new environment of globalized digital communications. The authors argue persuasively that social engagement measures require us to rethink traditional frameworks for analyzing ever-changing responses to digital social media [2].

The current collection of publications provides a good basis for understanding the comprehensive and multi-faceted role of language in constructing soft power. However, linguistic research in relation to soft power is an unstable field due to its internal dynamism, as is often the case in today's global interactions. We hope that this review will both summarize existing knowledge and, at the same time, serve as a propaedeutic that will pave the way for future academic research [4]. Based on the overall picture that emerges, it highlights the need for detailed research on the language of diplomatic dialogue and public communication policy as two of the most important ways to achieve an insightful understanding of the interconnected and complex links between language and soft power in the dynamically changing world of international relations [15].

3 Conceptual Framework

Tracing the international relationship between language and soft power also involves providing definitions of key terms. Language (in this science exercise) is a country's lexical arsenal used in diplomatic jargon and public discourse. Soft power, following [1], is the ability of one country to influence the preferences of other nations through cultural attractiveness and attraction rather than coercion or payment. Finally, diplomacy (where di refers to communication between two parties)—describes negotiations in international relations, dialogues or strategic communication between states to promote understanding and achieving diplomatic goals [17].

The intimate relationship between language and soft power comes from the persuasive and communicative power embedded in linguistic expression. Language choices represent how nations express their cultural values, present political positions, and cultivate relationships around the world. As Johnson notes in 2017, words remain an intangible part of the diplomatic arsenal, a strategic instrument that "can be used to shape perceptions and advance a nation's interests." The relationship between language and soft power rests largely on the ability of linguistic messages to resonate

with people, evoke emotions, and subtly shape the discursive tapestry that forms the backdrop for diplomatic elements [5].

Soft power is enhanced by a number of important factors, such as rhetorical devices and narrative structures, symbolic language, and popular cultural constructs; strengthening interchangeability as a key advantage of the language. The research of British linguist Rebecca Smith is based on Schelling's findings—apart from the military and economic potential of a nation, the most important thing for the world is how it speaks. Performative elements of language—timbre, rhythm and tone of speech; words, phrases and gestures; symbolism and allegory; literary devices and narrative structures all influence how a nation is perceived and represented, sometimes even more than its superpower status [22].

By combining these concepts, this robust framework provides a coherent frame of reference for analyzing the fluid and multifaceted relationship between language and power. It is also suitable not only for theorizing but also for a holistic understanding of the diverse dynamics of language strategically used by countries in the complex world of international relations.

4 Public Communication Strategies

This project is an in-depth analysis of the entire field of public communications strategies that are of course taken for granted, but upon closer examination can be considered essential elements of the nation's arsenal of soft power initiatives. Careful and in-depth research will soon reveal and expose countries' foreign policies communicated through a number of different multi-layered persuasion campaigns initiated by countries themselves through press releases, social media and official statements. By examining the intended causes of countries' campaigns, this study will allow us to examine and question the deliberate use of language and the impact of such rhetoric in shaping public opinion at home, but also abroad [15].

At the heart of this study is a careful consideration of the role of language in shaping public opinion. Drawing on the insightful work of Jones and Wang [16], who discuss recent developments in diplomatic communication in the context of changing digital trends, this study explores the details of how language support strategies in public communication can create national discourses. Analysis of the impact of language indicators on different target groups reveals the differentiated role of language in shaping collective opinion.

Drawing on theories outlined by Gilboa [13] that emphasize the role of media in soft power, this study goes beyond traditional means of communication and provides new insights into how nations leverage soft power through strategic manipulation of media strategy. These same media strategies focus on how nations use language to strategically organize and position themselves in relation to receptive audiences through mass media or private communications. Therefore, the examination of the media strategies analyzed in this study includes elements such as framing of content, salience of the issue or issue, contextualization of messages, as well as narratives

constructed and embedded in the image [6]. This provides a detailed understanding of the complex ways in which nations' language use shapes their soft power dynamics.

The aim of this study is to identify the characteristics of effective public communication that can increase soft power, through the analysis of several case studies, both successfully and unsuccessfully implemented. It looks for linguistic features that have acted as trigger mechanisms and would be similarly effective in other contexts to strategically and intentionally enhance a nation's soft power. A side effect of this endeavor will be insight into why certain attempts at public diplomacy are more or less effective than others. Combining this analysis with practical tips for policymakers and communicators, the second part aims to provide the reader with useful information and recommendations on how to increase a nation's "soft power" by making wise and intentional language choices. Comparing successful public diplomacy campaigns with cases of miscommunication provides practitioners with some interesting observations and advice on how nations can enhance their soft power through wise and intentional language choices.

We analyze language as a driving force of change in the world of international relations. A thorough examination of the mechanisms of public communication enables a significant contribution to the understanding of its continuous evolution.

5 Challenges and Critiques

Power, of course, is words: there is no more powerful tool in the soft power toolkit. However, there is no more challenging tool, as the instructive efforts of Johnson [14] and Smith [21] explain. And I have only scratched the surface of the challenges. We could go on like this. We could talk about ghosts in the machine, the linguistic ghost that appears when a nuanced headline in country A is misinterpreted by an individual reader in country B. We could address the limitations of cultural errors when one country tries to communicate in the given language of another without in-depth understanding of the cultural context of this language. But more than anything else in the world, I could talk about the English language. There's a reason why so many people tie their identity to speaking English: it takes an unlimited amount of time to master even one of the many variants of the language. However, even mastering one language family is not enough: it is necessary to familiarize yourself with the global catalog of courses in other foreign languages. And even then, you would be catching up on all the changes that are constantly taking place in everyone's language, especially in this rapidly changing digital age. This is the fickle nature of languages, which evolve and balance each other to provide the speech that individual nations and other collectivities use to guide the true purpose of national language policy: not the linguistic dialogues of citizens, but dialogues between groups quite different from themselves.

The ethical nature of language as a tool of influence is central to the analysis: as Lee and Kim [18] proudly state, this project "aims to explore the moral dimensions of the rhetorical choices made by practitioners of linguistic influence." I hope this

article will meet this standard by critically examining the ethical dimensions of rhetorical choices related to propaganda, disinformation, and the indoctrination and dehumanization of foreign adversaries that lead to political advantage.

Examining language as a tool of soft power, this section highlights the potential adverse consequences and hidden dangers of using certain languages for diplomatic purposes. Using existing literature, such as the insightful observations of Chen et al. [12] on borrowing as a soft power strategy that carries significant geopolitical implications, aims to uncover adverse effects such as diplomatic tensions or public opposition, offering thoughtful suggestions to policymakers. Firstly, approaching international relations (IR) theory through the grey areas of language as a power strategy offers a unique perspective on the consequences that arise when decision-makers try to attain diplomatic objectives through linguistic means. The goal is to bring something original to the global debate on international relations. Here we must indeed pause to examine the restrictions and failures by which a language so handy in many hands for soft power is encircled, limited even: to understand the terrain there is always need of more specific detail.

6 Case Studies

France on the other hand, is recognized as a purveyor of language-based soft power excellence on the global stage. A documented example of a language soft power strategy is the Alliance Française, or French language and cultural centers, a network of centers formed in 1883 to spread the French language and facilitate cultural exchange abroad. The Alliance Française now operates in more than 80 countries. In these centers, French is taught and foreigners are encouraged to visit France and participate in cultural exchange to spread the positive image of France abroad. This is done in at least four ways. In the first place, French language and culture is taught, and visitors are encouraged to undertake cultural tourism. Second, the promotion of cultural exchange is practiced. The stated mission of the Alliance Française is to ‘encourage the teaching of the French language, facilitate cultural exchanges and promote information on France and French civilization abroad’. Operating around the world, it stands out for its ability to maintain a global level of French language and culture. Simply by offering language courses, organizing cultural events and encouraging exchanges, France’s soft power support for its culture will continue far into the future, leaving its mark on the world stage [11]. Globalization of higher education. Baltimore: Johns Hopkins University Press.

Alliance Française demonstrates the enduring power of language as an instrument, not just a means of communication, for the development of cultural diplomacy. By promoting the French language abroad, France strengthens its soft power, raises its global prestige and strengthens significant cultural bridges. This active foreign policy betrays a deep-seated belief that language and culture go hand in hand to influence how the international community views other countries.

Another illustrative case is provided by the Chinese government's Confucius Institutes, language-oriented institutions whose purported raison d'être is to foster international exposure of Chinese language and culture. Modalities include providing language lessons, organizing cultural events, engaging in educational partnerships, and other practices, all aimed at strengthening China's soft power. Confucius Institutes are said to have generated controversy (particularly due to the potential political influence arising from their practices) and continue to attract considerable scholarly attention. Nevertheless, it can be seen as a remarkable example of the practice of culture-based soft power aimed at promoting China's linguistic and cultural appeal around the world.

Confucius Institutes are a powerful illustration of how language can function as a lever of soft power. By promoting the Chinese language and cultural values to a global audience, China is not only expanding its international standing but also attracting students and positive perceptions. But the example also highlights the challenges of soft power through language and the controversy it can create regarding academic freedom and potential political influence.

Ultimately, however, these case studies show that countries can use language to gain greater agency on the world stage and influence international perceptions—and these case studies offer lessons on this soft power technique in its most nuanced and effective form.

7 Future Trends and Implications

Our changing world is undergoing a continuous and complex evolution, a simultaneous movement driven by variables, from digitalization to geopolitical movements and profound cultural changes. Recent patterns appear to point to an increasing reliance on digital platforms and social media, and an increasing complexity of messages in public communications and diplomatic conversations. Changing cultural and political landscapes provide unique opportunities for nations to develop direct and immediate interactions with each other [16]. Another change we're seeing is the growing use of artificial intelligence in diplomatic messaging, which adds the potential for unprecedented efficiency in language applications in adapting to audiences with accuracy and subtlety [23]. After emerging from the post-war silence, linguistic diversity has gained importance in global forums, which we believe may change patterns of future discourse. This reflects a more inclusive and compassionate tone and spirit that we hope will be implemented in future soft power strategies.

But looking ahead, the soft power of language is poised for radical change. What makes language persist in exerting such an effective influence on the world suggests that it will only intensify its role as a powerful instrument of nation-states seeking to shape the cultural landscape [1]. The emergence of more immersive technologies—such as those offered by virtual reality—offers new forms of language-based soft power, with the potential to enable immersive cultural experiences in ways that have not been available to nations until now. The growing prevalence of multilingual

perspectives and voices suggests a new formulation of how nations adopt the voice of language in their arsenal of soft power [21].

From rapidly changing discursive practices to the way we communicate with each other, these new topographies have far-reaching consequences for the future of international relations and diplomacy. Countries that adopt innovative, sophisticated soft power language practices may be in an analytically privileged position to navigate the complexities of a globalized world and create deeper and more meaningful cultural connections as they establish diplomatic relationships [3, 7]. This post-millennial era of "hypertextuality", fueled by the increasing globalization of digitalization and the supercharged information age, also raises legitimate concerns about information security, fake news, and the potential for future state destabilization through the use of language and narratives in the cyberscape. Policymakers and diplomats must be skeptical of these threats and actively seek ethical and diplomatic solutions to make the most of the changing role of language in soft power and thus positively influence the future of international relations [10, 19].

The trends and implications identified above highlight the dynamic and changing conditions of language as a medium in the game of power. This shows that international relations must now involve anticipating, adapting and proactively responding to increasing changes at a rapid pace. As technology, culture and global dynamics continue to have a greater impact on our world than ever before, countries will need to learn more about using language as a soft power tool to ensure their impact is more sustainable. This means thinking strategically and adapting on behalf of nations to improve how they communicate their messages around the world [8, 9].

8 Conclusion

Global soft power influences international relations through the language that people use as a means of communication. Changing views on the special role of language in international relations can improve our understanding of how states pursue soft power strategies—in theory and in practice. From diplomatic theory and rhetoric studies to analysis of communication strategies and case studies of soft power around the world, research conducted over the past three years provides not only innovative theoretical ideas, but also practical implications for how companies and policymakers pursue national interests in the world. International arena.

The case studies of the Alliance Française and the Chinese Confucius Institutes also provide compelling examples of the dynamic impact that soft power initiatives that have language at their heart can have. Each highlights how international diplomacy works through, on behalf of, and using more than one language—whether through the use of French in educational and cultural programs, or the global promotion of Chinese language and culture around the world. Their wide-reaching effects

and sobering scope also demonstrate how it will be necessary to think harder—and more humbly—about the dangers, ethical complications and unintended consequences that invariably accompany the use of language as soft power. As countries continue to navigate this terrain, the need to think critically about the various dimensions of language strategy and their profound implications has never been stronger. This is necessary not only for policymakers, but also for international relations researchers. Given how the global diplomatic landscape is changing in new and challenging ways in the twenty-first century, perhaps a deeper understanding of the linguistic quagmire in international relations would be beneficial.

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The Impact of Internal Marketing Dimensions on Hotel Service Quality: A Field Study on Five-Star Hotels



Iyad A. A. Khanfar and Adnan Owais

Abstract The main goal of chapter is to examine the impact of internal marketing dimensions (namely, selection, motivation, delegation of authority, and internal communication) on the quality of services provided by hotels. In order to achieve this objective, the researchers adopted an analytical and descriptive approach that is appropriate for the nature of the study. A questionnaire was developed as the primary instrument for data collection and was distributed to a sample of 450 employees working in 15 five-star hotels located in Amman. Out of the total questionnaires distributed, 411 valid responses were collected and subsequently analyzed using the statistical software SPSS. The study yielded several significant findings, indicating that all internal marketing dimensions (selection, motivation, delegation of authority, and internal communication) have a noteworthy impact on hotel service quality, with a significance level of ($\alpha \leq 0.05$). As a result, the study concludes that management in five-star hotels should place greater emphasis on implementing advanced strategies during the employee selection process, as well as motivating employees in a manner that fosters their loyalty towards the hotel.

Keywords Internal marketing · Hotel service quality · Five-star hotels · Amman · Jordan

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1 Introduction

The notion of internal marketing, which has been the subject of recent scholarly investigation and organizational implementation, serves as a means for enhancing the caliber of products and services with the ultimate goal of attaining optimal performance. Organizations have recognized the necessity of introspection and, particularly, comprehending the viewpoints held by their workforce in relation to the organization itself. It is imperative for organizations to regard their employees as customers in order to secure triumph in the business realm.

Internal marketing, a contemporary marketing concept, has gained prominence in various sectors, emphasizing the significance of employees within companies and institutions. Its origins can be traced back to the 1950s, when quality managers in Japan were among the first to embrace this concept. At its core, internal marketing recognizes that the actions and efforts of employees within organizations constitute the internal product.

In the realm of five-star hotels, the significance of service quality cannot be overstated. As such, it becomes crucial for hotel management to equip their staff with the necessary knowledge and direction to effectively cater to the preferences and expectations of guests. It is imperative to provide continuous training and support to enhance skills of communication and foster a sense of contentment and fulfillment among employees in their respective roles. Consequently, hotels operating in this sector ought to devise marketing strategies that prioritize internal marketing aimed at employees, in conjunction with external marketing targeted at guests [4].

Internal marketing exercises an important role in prioritizing human resources by implementing efficient practices and policies. This transition from an external marketing perspective to internal marketing recognizes human resources as internal clients who possess their own needs and desires that require fulfillment. The objective is to establish unique and loyal relationships, guaranteeing mutual benefits for both parties involved. This is accomplished by generating value for individuals while simultaneously enabling the organization to acquire fresh talents and skills, strengthen its brand, and provide exceptional services [7].

1.1 Study Problem and Questions

The provision of high-quality hotel services in the hospitality industry, particularly in five-star hotels, relies heavily on the stability of human resources. As a result, there has been a significant emphasis on internal marketing, specifically in the hotel sector, with a focus on investing in human resources who directly interact with guests. This strategic focus is crucial in order to effectively compete in the highly competitive hospitality industry. Despite the growing number of five-star hotels in Amman that cater to both local and international customers, it is imperative to examine the impact of implementing the internal marketing concept on the quality of services

provided in Jordan as a whole, and in Amman specifically. This understanding is vital for improving the profitability of the hotel sector, considering the challenges and difficulties it faces. Furthermore, due to the competitive nature of the industry, customer expectations for service delivery have risen, prompting hotels to place greater emphasis on service quality in order to meet these demands. In fact, service quality is considered the most critical aspect of all hotel marketing activities.

Internal marketing is a key marketing strategy employed by five-star hotels in Amman, with the objective of meeting the needs of employees in order to deliver exceptional service to guests and ensure guest satisfaction. However, there are instances where these hotels may not fully grasp the significance of the internal marketing concept and its correlation with service quality, resulting in a significant challenge for these establishments. Inadequate attainment of the desired service quality level can have detrimental effects on the hotel's overall performance, particularly in terms of employee performance and service quality, ultimately leading to employee dissatisfaction. Hence, this study addresses the following primary question:

- What is the impact of internal marketing dimensions on the quality of services provided to guests in five-star hotels in Amman?

1.2 Study Objectives

The study intends to determine the impact of internal marketing dimensions on the quality of services in five-star hotels in Amman.

1.3 Study Hypotheses

Based on the above discussion, the following hypotheses have been formulated:

Main Hypothesis

- **H0**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of internal marketing dimensions (selection, motivation, delegation of authority, internal communication) on the quality of services in five-star hotels in Amman."

Subsidiary Hypotheses

- **H01**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of service provider selection on the quality of services provided in five-star hotels in Amman."
- **H02**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of service provider motivation on the quality of services provided in five-star hotels in Amman."

- **H03**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of service provider delegation of authority on the quality of services provided in five-star hotels in Amman."
- **H04**: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of service provider internal communication on the quality of services provided in five-star hotels in Amman."

2 Previous Studies

The results of a study conducted by Bennaamr and Almarshadi [6] yielded several notable conclusions, the most significant of which was the presence of a statistically significant impact of various factors, namely employment, training, rewards and incentives, and internal communication, on the quality of services offered by Saudi Telecom Company. Similarly, the results of a study conducted by Mahmoudi et al. [9] revealed a positive correlation between internal marketing strategies and the quality of services provided by hotels. The greater emphasis placed on internal aspects within the organization, along with a focus on employee satisfaction and efforts to meet their needs, directly contributes to higher levels of service quality and the ability to meet the expectations and requirements of external customers.

In a study conducted by Alawwal [3], it was discovered that internal marketing, in its different aspects, had a favorable effect on the job satisfaction and organizational loyalty of employees at Jawwal Company. The study also revealed the impact of job satisfaction on the employees' loyalty towards the organization. Moreover, the findings indicated that job satisfaction played a mediating role in the relationship between internal marketing and organizational loyalty among the employees. Additionally, the study observed positive associations between age, income, and organizational loyalty.

Based on the research conducted by Al Majali et al. [2], it was determined that the initial primary hypothesis was supported, signifying a noteworthy and statistically significant beneficial influence of the independent variables on the job satisfaction of employees within the banking industry. Furthermore, the second primary hypothesis was also validated, demonstrating a statistically significant positive correlation between employee job satisfaction and their overall performance.

The research conducted by Shayeb [11] revealed that internal marketing plays a crucial role in the success of an institution and is a fundamental prerequisite for effective external marketing. Moreover, the study revealed a positive correlation between internal marketing and the quality of health services. Internal marketing encompasses the development of policies and programs that target the organization's employees, also known as internal customers, with the aim of achieving high levels of satisfaction among them. However, the practical implementation of internal marketing in the institution under investigation does not prioritize the enhancement of healthcare service quality. Furthermore, the institution only partially embraces the concept of

internal marketing, focusing solely on certain aspects such as training and internal communications, while neglecting others.

According to the research conducted by Abu Awadah and Atallah [1], it was determined that the company places a higher level of significance on the internal marketing aspect of "employee recruitment method," with subsequent emphasis on training, dissemination of marketing information, administrative support, and incentive and reward systems, in that order.

3 Study Methodology

The research encompassed various objectives, namely: assessing the influence of internal marketing dimensions (service provider selection, motivation, delegation of authority, internal communications) on the quality of services offered by five-star hotels in Amman. These objectives were formulated based on a series of inquiries that constituted the framework of the study. In order to accomplish these objectives, the researchers employed the analytical descriptive approach, dividing the study into two distinct sections.

The initial section of the chapter encompassed the theoretical framework, wherein a comprehensive elucidation of internal marketing and its various dimensions, alongside hotel services, was provided. Furthermore, it entailed a review of prior research pertaining to the influence exercised by internal marketing dimensions on the quality of hotel services.

The subsequent phase of the research encompassed the analytical component, wherein an exhaustive examination of the study data was conducted. This entailed scrutinizing demographic variables, testing hypotheses, and computing the average scores derived from the responses obtained from the selected study participants. To facilitate this process, a meticulously crafted questionnaire was formulated and administered to the designated study sample, which consisted of employees affiliated with prestigious five-star hotels situated in Amman, Jordan. Subsequently, the data pertaining to the study sample was meticulously gathered and subjected to rigorous analysis.

3.1 Study Population

To ensure the congruity between the study's nature and variables, the study population comprised employees from five-star hotels in Amman, Jordan. The study encompassed a total of (450) employees, representing 15 five-star hotels in Amman.

3.2 Study Sample

Considering the prevailing conditions within the hotel industry due to COVID-19 pandemic, the researchers made the decision to select a study sample consisting of (450) employees employed in five-star hotels located in Amman. Subsequently, the questionnaires were distributed among the participants, and (411) of them were successfully collected, while (38) questionnaires were not returned. The collected questionnaires were then subjected to analysis using the statistical software SPSS, with the aim of examining the various dimensions of internal marketing and service quality:

- Standard deviation and arithmetic mean.
- Frequencies and percentages.
- Pearson correlation coefficient.
- Simple regression analysis.

The distribution of (450) questionnaires was conducted by the researchers utilizing a simple random sampling method, with meticulous attention paid to ensuring equitable representation across the hotels. This was achieved by allocating (30) questionnaires to each of the 15 five-star hotels in Amman.

3.3 Data Collection Methods

Primary Sources

The design of a questionnaire, specifically tailored to align with the study's objectives, research questions, and hypotheses, served as the primary method utilized by the researchers. This design drew upon existing literature and previous studies in order to ensure its effectiveness. Once the design was completed, it underwent a comprehensive evaluation and feedback process, involving multiple knowledgeable judges.

Secondary Sources

The study's theoretical framework is primarily built upon a collection of secondary sources, which encompassed Arabic and foreign resources, previous studies, and reputable scientific websites.

3.4 Study Instrument Reliability

Cronbach's Alpha coefficient test is utilized to evaluate the internal consistency of the questionnaire items, with a minimum expected value of 0.70. The Alpha values for the different dimensions of the study are presented in Table 1.

Table 1 Cronbach's Alpha values for study variables

Dimension	Number of items	Calculated Alpha value
Selection	4	0.709
Motivation	5	0.899
Delegation of authority	6	0.854
Internal communications	6	0.823
Quality of hotel services	5	0.886

3.5 Statistical Methods Used

Standard deviations and Arithmetic means were used to rank the items measuring each variable, thus determining the importance of each. The item scores were evaluated based on the following scale:

- Low: Arithmetic mean between (1—less than 2.34)
- Medium: Arithmetic mean between (2.34—less than 3.67)
- High: Arithmetic mean between (3.67—5).

The reliability values presented in Table 1 demonstrate that the study variables exhibit acceptable levels of reliability, making them suitable for the intended purposes of the research, as the minimum acceptable threshold for reliability is set at 70%.

4 Hypothesis Testing

4.1 Main Hypothesis

- H0: "There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of the dimensions of internal marketing (selection, motivation, delegation of authority, internal communications) on the quality of services in five-star hotels in Amman."

To examine the primary hypothesis, a simple regression analysis is employed. The hypothesis, H0, posits that there is no statistically significant impact, at a significance level ($\alpha \leq 0.05$), of the dimensions of internal marketing (selection, motivation, delegation of authority, internal communications) on the quality of services in five-star hotels situated in Amman. The findings reveal that the dimensions of internal marketing (selection, motivation, delegation of authority, internal communications) account for approximately 24% of the variability in service quality, as indicated by an R Square value of 0.2350.

To examine the sub-hypotheses, a multiple regression analysis is conducted in which the independent variables (selection, motivation, delegation of authority,

Table 2 Regression analysis of the impact of internal marketing on service quality in five-star hotels in Amman

Variables	R	R^2	T	F	B	Sig
Selection	0.494	0.244	4.54	31.611	0.210	0.000
Motivation	0.494	0.244	3.64	31.611	0.174	0.000
Delegation of authority	0.494	0.244	2.64	31.611	0.131	0.000
Internal communications	0.494	0.244	4.91	31.611	0.229	0.000

Table 3 Results of testing the main hypothesis

Variables	R	R^2	T	F	B	Sig
Internal marketing	0.486	0.236	11.061	122.352	0.689	0.000
Service quality						

internal communications) were included in the regression model, while service quality served as the dependent variable. The results proceed as follows Table 2:

Based on the findings presented in the table, it can be stated that the combined internal marketing dimensions account for approximately 24.4% of the variability observed in service quality. The obtained F value of 31.611 is highly significant at the 0.000 level, thus providing strong evidence supporting the validity of the regression model employed to test the sub-hypotheses (Table 3).

According to the variance table, the F value is 122.352, which has a significance level of 0.000, indicating that it is less than the predetermined threshold of 0.05. This implies that the model utilized in this study is valid for testing the research hypotheses. The regression coefficient is 0.486, and the T value is 11.061, with a significance level of 0.000, suggesting that there is a collective impact of the internal marketing dimensions on service quality. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted, which states that there is a statistically significant influence, at a significance level of $\alpha \leq 0.05$, of the internal marketing dimensions (selection, motivation, delegation of authority, internal communications) on the quality of services in five-star hotels in Amman.

4.2 Testing Sub-hypotheses

Sub-Hypothesis 1

- H01: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) between the selection of the service provider and the quality of services provided in five-star hotels in Amman."
- **Research Question 1:** Is there an impact of the service provider selection on the quality of services provided in five-star hotels in Amman? (Table 4)

Table 4 Results of testing sub-hypothesis 1

Variables	R	R^2	T	F	B	Sig
Selection	0.494	0.244	4.54	31.611	0.210	0.000
Service quality						

The statistical analysis presented in the table demonstrates that all dimensions of internal marketing, including selection, motivation, delegation of authority, and internal communications, have a significant influence on service quality. Specifically, the regression coefficient for the selection variable is 0.210, and the T value is 4.54, with a significance level of 0.000, indicating a statistically significant impact of selection on service quality. Consequently, the null sub-hypothesis 1 is rejected, and the alternative sub-hypothesis is accepted, which states that there is a statistically significant relationship ($\alpha \leq 0.05$) between the selection of service providers and the quality of services offered in five-star hotels in Amman.

4.3 Sub-hypothesis 2

- H02: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) between the motivation of the service provider and the quality of services provided in five-star hotels in Amman." (Table 5).
- **Research Question 2:** Is there an impact of the service provider's motivation on the quality of services provided in five-star hotels in Amman?

Based on the data presented in the table, it can be concluded that motivation plays a crucial role in determining service quality. The regression coefficient of 0.174, along with a T value of 3.64 at a significance level of 0.000, demonstrates a statistically significant impact. Consequently, the null sub-hypothesis 2 is rejected, and the alternative sub-hypothesis is accepted, which states that there exists a statistically significant relationship ($\alpha \leq 0.05$) between the motivation of service providers and the quality of services offered in five-star hotels located in Amman.

Table 5 Results of testing sub-hypothesis 2

Variables	R	R^2	T	F	B	Sig
Motivation	0.494	0.244	3.64	31.611	0.174	0.000
Service quality						

4.4 Sub-hypothesis 3

- H03: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) between the delegation of authority to the service provider and the quality of services provided in five-star hotels in Amman."
- **Research Question 3:** Is there an impact of the delegation of authority to the service provider on the quality of services provided in five-star hotels in Amman? (Table 6)

According to the data presented in the table, there is a notable and statistically significant effect of delegating authority on the quality of service. This is supported by a regression coefficient of 0.131 and a T value of 2.64, both of which are significant at a level of 0.000. As a result, we reject the null sub-hypothesis 3 and accept the alternative sub-hypothesis, which states that there is a statistically significant impact between delegating authority to service providers and the quality of services offered in five-star hotels in Amman, at a significance level of $\alpha \leq 0.05$.

Sub-Hypothesis 4

- H04: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) between the internal communications of the service provider and the quality of services provided in five-star hotels in Amman."
- **Research Question 4:** Is there an impact of the internal communications with the service provider on the quality of services provided in five-star hotels in Amman? (Table 7)

Based on the data presented in the table, it can be concluded that there is a noteworthy and meaningful influence of internal communications on the quality of service. This conclusion is supported by the regression coefficient of 0.229 and the T value of 4.91, which are both statistically significant at a significance level of 0.000. As a result, the null sub-hypothesis 4 is rejected, and the alternative sub-hypothesis is accepted. This alternative sub-hypothesis asserts that there is indeed a statistically significant impact, at a significance level of $\alpha \leq 0.05$, between the

Table 6 Results of testing sub-hypothesis 3

Variables	R	R^2	T	F	B	Sig
Delegation of authority	0.494	0.244	2.64	31.611	0.131	0.000
Service quality						

Table 7 Results of testing sub-hypothesis 4

Variables	R	R^2	T	F	B	Sig
Internal communications	0.494	0.244	4.91	31.611	0.229	0.000
Service quality						

internal communications of the service provider and the quality of services provided in five-star hotels in Amman.

5 Discussion of Results

The quality of hotel services is significantly influenced by the process of employee selection, with a positive moderate correlation observed. This correlation accounts for approximately 24.4% of the variation in hotel service quality. It suggests that hotels place importance on selecting skilled and knowledgeable employees who can deliver exceptional service and effectively engage with guests, thereby enhancing the overall quality of hotel services. This finding stands in contrast to a previous study conducted by Asif [5], which focused on the initial phases of internal marketing in universities within the same geographical area. The study indicated a weak association between internal marketing and organizational commitment among university staff.

Hotels employ various motivational strategies to enhance the performance and job satisfaction of their employees, ultimately leading to the provision of high-quality service and guest satisfaction. Within the hotel setting, employees actively contribute to the implementation of internal marketing practices, which not only helps in minimizing errors but also fosters a strong desire for self-improvement and increased efficiency. Consequently, this cultivates a sense of loyalty towards the hotel. The importance of motivation as a variable in this context is moderately significant, with an average rating of 3.26. It is worth noting that a study conducted by Mataghin and Salwa [10] on industrial companies in Jordan revealed a partial implementation of internal marketing dimensions, lacking employee involvement in decision-making processes and fair salary and incentive systems.

In the pursuit of enhancing the quality of services provided to guests, hotels employ administrative organizational structures that aim to empower their employees in decision-making. This approach fosters a sense of teamwork and reduces psychological barriers associated with job roles. The delegation of authority within these structures is deemed moderately important, with an average rating of 3.52. Furthermore, there is a statistically significant and moderately positive relationship between delegation of authority and hotel service quality. This suggests that granting employees authority and involving them in decision-making processes contributes to the improvement of service quality. It also indicates that hotel managements are implementing various dimensions of internal marketing within the hotel environment.

The findings of this study are in accordance with the research conducted by Kozaric in [8]. It underscores the importance for managers to prioritize motivation in order to uphold employee performance and service quality. Moreover, it proposes alternative strategies to motivate employees, with a particular emphasis on the significance of financial incentives. Additionally, the study emphasizes the critical role of employee involvement in decision-making as a fundamental approach to achieve and enhance the concept of internal marketing within organizations. This, in turn, has a positive impact on customer satisfaction.

The ease of information dissemination among employees is a significant aspect of internal communication, as indicated by an average score of 3.43. This has a positive influence on the overall work atmosphere. In the context of five-star hotels in Amman, the implementation of internal marketing aligns with the findings of Abu Awadah and Atallah's [1] study on Jawwal Company. This study emphasizes the importance of various dimensions of internal marketing, such as employee selection, training, and dissemination of marketing information, administrative support, and incentive systems. It further highlights the impact of internal marketing policies on the quality of services provided. By improving and enhancing employees' skills and competencies, internal marketing programs contribute to the delivery of high-quality services to customers.

5.1 Recommendations

- The management of five-star hotels in Amman should appreciate the importance of the conclusions from the study regarding the implementation of the concept of internal marketing and its positive impact on the quality of hotel service, providing motivation to continue providing high-quality services.
- More emphasis should be placed on the dimension of employee motivation to increase their loyalty to the hotel.
- Staff selection standards and methods should be constantly updated and developed to ensure that hotels employ competent and qualified staff.
- Hotel management should work to improve and develop the quality of hotel services provided to guests, keeping in mind the competitive nature of the industry.
- Five-star hotels in Amman should adopt science-based programs and strategies to improve the quality of hotel services that aim to improve the application of internal marketing concepts in hotels to ensure guest satisfaction.

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The Importance of Quality of Work Life (QWL) in Improving Job Performance Levels Among Employees in Government Institutions



Jiries Abu Ghannam and Khaled Alzeaideen

Abstract This study aimed to identify the level of quality of career in improving job performance levels, and the study was conducted on the employees of government institutions in the Bethlehem Governorate. The study followed the descriptive analytical approach to conduct the study and the questionnaire as a main tool for collecting information. The study was conducted on a random sample of (59) questionnaires, so that the sample items were distributed to the study population, employees of government institutions in a governorate in the Bethlehem Governorate. The study reached several results, the most important of which are: The results showed that the degree of physical work conditions was moderate, as the most common manifestations were the government institutions administration is keen on workers to follow prevention and safety measures during work, followed by government institutions to provide facilities for workers to complete their work such as (technological means, transportation, means of communication, etc. The results showed that the degree of balance between life and work was medium, as it was the most common manifestations. I find enough time after the end of the official working hours to carry out my personal and social duties, followed by government institutions providing facilities and training programs to support and develop employees.

Keywords Quality of Work Life (QWL) · Job performance · Government institutions · Bethlehem governorate · Human capital theory

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1 Introduction

Human resources are the cornerstone of contemporary administrative thought, which has led most institutions and organizations to increase their focus on human resources. This focus includes providing essential aspects such as a healthy and safe work environment, supporting and involving employees in decision-making processes, and offering adequate social, economic, and health care. This aligns with the core concept of quality of work life (QWL), which emphasizes achieving harmony between the individual and their job, and considering the human aspects of work as a social, ethical, and moral responsibility of institutions to improve productivity and achieve societal satisfaction with their performance and services provided [4].

Implementing QWL in organizations is a major concern aimed at achieving sustainable human development for employees. This can only be accomplished by improving working conditions, whether in terms of health or material aspects, with the primary goal of enhancing employees' efficiency, which naturally leads to organizational development and achieving desired objectives [2, 22–34].

Human resources are a fundamental element in the organizational structure, influencing productivity through employee performance and job satisfaction. Job satisfaction reflects how well an individual meets job requirements, understands needs, and recognizes desires according to the standards set by human resource management [3, 5–14].

The human element is central to the production process. Institutions strive to provide a skilled workforce by ensuring their training and equipping them with various skills and techniques necessary for executing activities and programs to achieve goals and profits effectively. Continuous dynamic changes necessitate ongoing improvement to ensure sustainability and continuity [1, 15–21].

Problem Statement:

Palestinian governmental institutions may face significant challenges that require managers to continuously monitor employee performance. This necessitates measuring performance according to specific criteria. The complexity of performance in the public sector is heightened by the need to account for the services provided to the public in exchange for the use of public funds. Thus, the main research question is:

What is the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate?

Importance of the Study:

The importance of this study arises from the following:

1 It addresses a recent variable in organizational behavior literature, namely QWL, which aligns with contemporary administrative developments.
2 The study's significance is also derived from its application to governmental institutions in Bethlehem Governorate, which face numerous challenges and work

pressures affecting their leadership and directly impacting their job performance, limiting their desire for innovation and professional creativity.
3 It aims to propose a set of mechanisms that could improve the performance levels of employees in government institutions in Bethlehem Governorate.

Objectives of the Study:

The primary objective of this study is:

- To identify the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate.

Secondary objectives include:

1 Identifying the level of performance evaluation in government institutions in Bethlehem Governorate.
2 Determining the degree of job satisfaction among employees in government institutions in Bethlehem Governorate.
3 Understanding the relationship between employees and their superiors in government institutions in Bethlehem Governorate.
4 Assessing the level of incentives in government institutions in Bethlehem Governorate.
5 Exploring the relationship between QWL and performance levels in government institutions in Bethlehem Governorate.
6 Identifying statistically significant differences at the level of significance ($\alpha \leq 0.05$) regarding the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate based on study variables (gender, educational qualification, years of experience, monthly income, job title).

Research Questions:

1 Do physical work conditions play a role in QWL?
2 Does the work-life balance contribute to QWL?
3 Do wages and rewards influence QWL?
4 Does the level of justice and equality affect QWL?
5 Does job security and stability impact QWL?
6 What is the level of job performance in government institutions in Bethlehem Governorate?

Hypotheses:

1 There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to gender.
2 There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to educational qualification.

3 There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to job title.
4 There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to monthly income.
5 There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to years of experience.

2 Methodology

The research team used the descriptive analytical method, which compares, interprets, and evaluates in hopes of reaching meaningful generalizations that increase the body of knowledge on the subject.

Study Population:

This study addresses the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate. Therefore, the study population consisted of employees in government institutions in Bethlehem Governorate.

Sample:

The study was conducted on a random sample consisting of 59 questionnaires distributed to employees in government institutions in Bethlehem Governorate.

Research Instrument:

A questionnaire was constructed to gather the respondents' views on the study topic.

Reliability of the Research Instrument:

The reliability of the research instrument was verified by examining the internal consistency of the questionnaire items using Cronbach's Alpha coefficient on the total study sample, which yielded a reliability value of 0.94, indicating a very high level of reliability.

3 Results

Research Question 1

What is the importance of quality of work life (QWL) in improving the performance levels of employees in government institutions in bethlehem governorate?

The importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate was found to be moderate. The mean score for this importance was 2.86, with a standard deviation of 0.53.

Research Question 2

What are the main aspects of physical work conditions?

The degree of physical work conditions was moderate, with a mean score of 3.42. The most common aspects were the adherence to safety and precautionary measures at work, with a mean score of 3.63, followed by the provision of facilities to help employees perform their tasks, such as technological means, transportation, and communication tools, with a mean score of 3.53.

Research Question 3

What are the main aspects of work-life balance?

The degree of work-life balance was moderate, with a mean score of 2.79. The most common aspects were having enough time after work hours to fulfill personal and social duties, with a mean score of 3.24, followed by the provision of training programs and support by government institutions to develop employees, with a mean score of 3.20.

Research Question 4

What are the main aspects of wages and rewards?

The degree of wages and rewards was moderate, with a mean score of 2.41. The most common aspect was the search for additional sources of income to increase income levels, with a mean score of 3.86, followed by the belief that government institutions have sufficient material and economic resources to meet their financial obligations towards employee salaries, with a mean score of 3.63. The least common aspect was satisfaction with annual salary increments, with a mean score of 1.76.

Research Question 5

What are the main aspects of justice and equality?

The degree of justice and equality was moderate, with a mean score of 2.36. The most common aspect was the feeling that managers strive to promote cooperation and friendliness among colleagues, with a mean score of 2.93, followed by efforts by senior management to enhance principles of brotherhood and cooperation among employees, with a mean score of 2.86. The least common aspect was setting wages based on performance, with a mean score of 1.81.

Research Question 6

What are the main aspects of job security and stability?

The degree of job security and stability was moderate, with a mean score of 2.86. The most common aspect was the feeling of job stability and security in the governmental job, with a mean score of 3.27, followed by working in an environment characterized by mutual trust and security among all parties, with a mean score of 3.25.

Research Question 7

What are the main aspects of job performance in government institutions in Bethlehem Governorate?

The level of job performance in government institutions in Bethlehem Governorate was moderate, with a mean score of 3.26. The most common aspect was the ability of employees to work and adapt to emergencies, with a mean score of 3.73, followed by the completion of transaction procedures within their specified time, with a mean score of 3.64.

Hypotheses Testing

Hypothesis 1

There are no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate attributed to gender.

There were statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to gender. The differences favored male employees, with a mean score of 3.01, compared to female employees, with a mean score of 2.69.

Hypothesis 2

There are no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate attributed to job title.

There were no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to job title.

Hypothesis 3

There are no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate attributed to educational qualification.

There were no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to educational qualification.

Hypothesis 4

There are no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate attributed to monthly income in shekels.

There were no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to monthly income in shekels.

Hypothesis 5

There are no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving the performance levels of employees in government institutions in Bethlehem Governorate attributed to years of experience.

There were no statistically significant differences at the level $\alpha \leq 0.05$ in the importance of QWL in improving performance levels of employees in government institutions in Bethlehem Governorate attributed to years of experience.

4 Conclusion

In conclusion, the study findings indicate that the government institutions demonstrate a moderate level of attention to employees' physical work conditions and work-life balance. The results show the administration places emphasis on promoting safety and preventative measures during the workday. Additionally, the institutions provide various facilities and resources to support employees in completing their job duties, such as technological tools, transportation, and communication means. Furthermore, the results suggest a reasonable level of balance between employees' work responsibilities and personal/social obligations, with adequate time allotted after official work hours. The institutions also offer training programs to help develop and support their workforce. Overall, the findings reveal the government organizations are making steady efforts to ensure reasonably favorable physical work environments and a suitable work-life equilibrium for their employees, though there may be room for further improvements in these areas. These workforce-oriented practices appear to be contributing positively to employee satisfaction and productivity.

5 Recommendations

Based on the above findings, the following key recommendations can be summarized:

1. **Improve Physical Work Conditions:** Enhance comfortable working conditions by providing necessary facilities and ensuring occupational safety and health elements are in place.
2. **Provide Training Programs:** Support and develop employees by offering training programs, while catering to employees' preferences and interests through cultural, awareness, and educational programs.
3. **Improve Living Conditions:** Ensure the timely and complete payment of salaries to improve employees' living conditions.
4. **Adjust Salaries to Living Costs:** Improve salary levels to keep up with the rising cost of living, ensuring employees' needs are adequately met.

5. **Offer Incentives:** Provide both financial and non-financial incentives for high-performing employees, ensuring fairness and equity across all administrative levels.
6. **Fair Promotions:** Implement promotions based on competence and professional performance, ensuring fairness and justice among all employees.
7. **Encourage Employee Participation:** Foster an environment where employees can express their opinions on decisions affecting their work, and promote the principle of participation in decision-making, particularly in matters of delegation and empowerment.

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Skilled Migration from Arab Countries



Saqer Sulaiman and Ala Eddin Sadeq

Abstract Over the last decades, Arab countries have experienced significant emigration towards developed countries, the frequent emigration from Arab countries led to brain drain. Generally, skilled migration considers a controversial issue due to its impacts on economic and social issues in the origin countries. On the one hand, it depleted the Arab countries of their human capital, while on the other hand, it considers an expected outcome to the distortion in the Arab labor market. Remittances are the most positive impacts of skilled migration from Arab countries, however, the role of highly skilled migrants in the transfer of knowledge and best practices are still one of the disputed issues in the Arab countries. This paper reviews the magnitude of the skilled from Arab countries to developed countries, its drivers, and determinants and the way it effects on the development of the Arabic countries and the well-being of their people. The study concluded that despite some benefits of skilled migration such as remittances and decreases the unemployment rate among youth, the Arab countries are suffered as a result of brain drain. The losses are the highest in such vital sectors as education and health.

Keywords Skilled migration · Brain drain · Development · Remittances · Highly skilled migrants · Arab countries · Low-and middle-income countries

1 Introduction

Skilled migration or as it described in many discourses as “brain drain”. Is used widely to describe the out-migration of intellectual and highly skilled people who often have high levels of technical expertise. They emigrate from developing or less

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economically-developed countries to countries which can be characterized by better professional, economic or geographical features. Skilled migration has been a topic of discussion for many years in many developing countries due to its high impacts on the economic and social condition in these countries. Many studies have been discussed it from different angles and perspectives. According to [9], "There were 247 articles on skilled migration written between 2005 and 2009 about twice as many as over the previous 15 years combined" (p. 2). Most of these articles focused on the impacts skilled migration on origin countries and destination countries. The seriousness and complexity of skilled migration calls for more focus on its impacts and repercussions.

At the same time, the UNESCO considers skilled migration backward technology transfer and defined brain drain as "an abnormal form of scientific exchange between countries, characterized by a one-way flow in favor of the most highly developed, countries" [13]. While Rapoport and Docquier [6] note in their entry in the New Palgrave Dictionary that it is most commonly used to denote the migration of engineers, physicians, scientists, and other very highly skilled professionals with university training. Typically, these movements are from developing to developed countries [9: 3].

Skilled migration has been a topic of discussion for many years in Arab societies and governments due to its high impacts on the economic and social condition in these countries. Hence, this study seeks to answer the following questions:

What are the magnitude and characteristics of skilled migration from the Arab world? What are the factors that contribute to skilled migration? What are the different impacts of skilled migration on the countries of origin? How can the governments counter the adverse effects of brain drain, and involve highly skilled migrants in development programs in their home country?

2 Magnitude and Characteristics of Skilled Migration from the Arab World

The mutual and interrelated relationship between migration and globalization remains a crucial context for understanding the phenomenon of brain drain as globalization drives migration and affects its directions and forms. Similarly, the international migration is a complex and multidimensional societal phenomenon. It stems not only from local and regional factors, but it is also the globalization tendency that fuels this phenomenon. Indeed, "globalization provides a new platform of cooperation. This platform enables individuals, groups, companies, and universities anywhere in the world to collaborate for the purposes of innovation, production, education, research, entertainment." [8: 204]. Furthermore, globalization has facilitated communications among people from different areas and opened up opportunity for them to agglomerate where it is already abundant in the most economically advanced countries.

Despite the fact that the skilled migration is a global phenomenon, its rate varies significantly across countries. Data shows that the threat of brain drain in countries with a small population is usually higher than in highly populated countries. "In average 7.3% of tertiary-educated people of the developing countries work in higher-income countries. This ratio varies from 5.4% (or below) in developing countries with populations of 40 million or more to 13% in sub-Saharan Africa and to 45% in small developing island nations" [9: 10].

In spite of the shortage of studies and data about skilled migration from the Arab world, some Arab organizations and researchers try to study this phenomenon by focusing on its various dimensions. Arab countries are suffering from the loss of their newly qualified medical doctors, engineers, and scientists each year, many of them moving to the United Kingdom, the United States, and Canada. According to the statistics of the League of Arab States and the Arab Labor Organization, the Arab world accounts for about 31% of the brain drain from developing countries, about 50% of doctors, 23% of engineers, and 15% of the scientists of the total Arab talent migrated to Europe and the United States and Canada [18]. For example, in "the United Kingdom the percentage of Arab doctors of the total physicians working there is 34%" [7]. Data show that the phenomenon of high skilled migration has increased dramatically in the last decade. For example, more than one-third of emigrants (35.7%) hold university and higher degrees [17: 109].

According to the regional report about the migration of the [15: 88, 90] "about 74% of Arab origin researchers are working in a scientific field such as physics, Biology, information technology…etc. at the French National Center for Scientific Research 70% of the directors of the departments of mathematics, physics and, technologies are Arab origins researchers." In a similar vein, the results of the Arab opinion index [2] indicated that "28% of the citizen of the Arab region want to emigrate, this shows that there is an increase of 6% for those wishing to emigrate from the 2020 survey" [2: 51].

3 Drivers of Skilled Migration from Arab Countries

Generally speaking, people often migrate in order to improve their standard of living. The decision to migrate is often aimed to achieve economic prosperity and social welfare. There two main approaches explained skilled migration. The first one is the individual approach through which skilled individuals are searching for their identity intellectually and professionally, secure a comfortable living and working conditions, ensure freedom of thought and the possibility of creativity, which unfortunately is not available in their home country. The second approach deals with skilled migration as an international phenomenon and extends deeply in economic systems. This approach focuses on the demand side and tries to find a correlation between the phenomenon of brain drain and the global market for highly qualified people. Reports of some regional and international organizations pointed out a relation between globalization and skilled migration. The regional report about the migration of the [15] reveals

that there is a competition to attract, and recruit highly skilled and qualified persons from certain parts of the world. The need for this kind of immigrants has grown over time as a result of globalization and open markets" [15: 35].

By using a lower cost foreign labor force, global companies can reduce the cost of their production and increase their competitive advantages and profits. However, migration decision may be affected by other factors than as well "They may be driven more by broader career concerns such as the quality of opportunities to conduct research, to work with best experts of their profession, and to learn from the best, as well as lifestyle and family reasons, than by how much more people could earn abroad" [3]. The factors that contribute to skilled migration from Arab countries and encourage emigrants to stay in the destination countries can be summarized into two main categories: internal pushing factors and external incentive factors.

3.1 Internal Pushing Factors

These factors include; economic factors, political factors, corruption and bribery, and Level of scientific research and lack of vacancies in some scientific and technological fields.

Economic factors. In general terms, the economic factors considered as the most important driving force behind the decision of migration especially among highly skilled people, for example in Africa, a Salary discrepancies and differences in working conditions between African and developed countries stimulate brain drain [12]. The unemployment rate is one of the most important indicators that reflect the economic situation in any country. Unemployment rate reflects the inability of societies in creating adequate new job opportunities to absorb the annual increase in the size of the new entrants to the labor market [10]. One should recognize that the labor market in most Arab countries were unable to absorb many of new graduated students and highly skilled people, which increases the rate of youth unemployment in the Arab world. The total unemployment rate in the Arab countries reached 10.9% in the year 2019–2020, while the unemployment rate among Arab youth increased to reach 27.4% for the same period. These percentages are pretty much higher than the unemployment rates at the global level, where the total unemployment rate is 5.6%, and among youth it is 15.4% [20: 153]. Table 1 shows the unemployment rate in some Arab Countries with a high rate of migration.

Table 1 shows an increase in the unemployment rate in the Arab countries which is very high compared to the global average. In general, these percentages maintained their rates or increased slightly, for example in Palestine, "the unemployment rate is 24.4% in 2022, 13.1% in West Bank and 45.3% in Gaza Strip" [21: 26]. In some Arab countries, the unemployment rates among educated people are higher than among less educated ones. For instance, in Jordan in 2011, unemployment among graduates was 16% against an official overall rate of 13% [21: 156]. Under these circumstances, migration became inevitably the best option for educated and highly skilled people.

Table 1 Unemployment rate in some Arab countries with a high rate of migration in 2019

Country	Unemployment rate	
	Total	Youth
Algeria	11.7	29.5
Lebanon	6.2	17.6
Tunisia	16.0	36.3
Jordan	14.7	35.0
Libya	18.6	50.5
Palestine	26.2	42.0
Egypt	10.8	31.1
Morocco	9.0	22.1
Iraq	12.8	25.1
Syria	8.4	20.9

Source [20]: Arab Human Development Report: Work and employment 2022. (Table 11), p. 153

The inevitable conclusion is that there is a positive correlation between the increase in unemployment rate and Arab skilled migration to developed countries.

Another important indicator that indicates the economic condition in a country is GDP per capita. The highest Arab countries in brain drain Egypt, Lebanon, Morocco, Iraq, Syria, and Tunisia show a lower GDP per capita [10]. Table 2 shows the gross domestic product and per capita GDP in some Arab countries.

In general, the assessment of the Arab public opinion of the economic situation in their countries was negative. According to the results of the [2] "the majority of respondents indicated that the economic conditions in their countries are bad or very bad"[2]: 36). In short, according to the opinion of the Arab citizens, the economic

Table 2 Gross domestic product and per capita GDP in some Arab countries in 2018

Country	Gross domestic product (million $)	Per capita GDP ($)
Algeria	172.780	3.980
Lebanon	58.565	9.645
Tunisia	38.732	3.287
Palestine	16.277	2.946
Egypt	302.256	3.046
Morocco	119.040	3.345
Iraq	224.462	5.738
Syria	60.043	831
Arab Countries	2.774.321	6.358
The world	87. 265.226	11.355

Source [11] World Economic Outlook Database

conditions in the Arab countries have been heading towards the worst since 2012 until now, and they have remained so without fundamental changes.

Political factors. After the Arab Spring phenomenon appears in 2011, the political situation in most of the Arab countries characterized by instability and prevalence of violence. According to the Internal Displacement Monitoring Centre "by July 2015, those displaced by the Syrian conflict alone had reached 11.6 million. Of these, 7.6 million were internally displaced persons, while the rest were refugees outside their country of nationality" [21]. According to the [2], the Arab citizens' evaluation of the political condition in the Arab countries was less optimistic than in 2020, as the percentage of those who indicated that the political condition is bad or very bad was 49%, compared to 47% in the 2020 poll [2: 41]. This indicates that the Arab citizens think that the political situation is heading towards the worst in many Arab countries. At the same time, most of the Arab countries suffered from the absence of democracy, freedom, and right of expression. The immigrant's life significantly affected by the life patterns of the destination country, such as democracy, liberty…etc., and this makes it difficult for him to return and live under repressive regimes. Therefore, "Scientific progress, political stability, democratic environment, and freedom of expression are motivations for prospective migrants as well, in addition to higher incomes and freedom of professional practices" [1:13].

Generally speaking, Political factors play a much larger role as driving force of migration of skilled people especially in countries suffering from political disorder. Docquier & Rapoport [6: 7] argued that "Skilled emigration is highest (higher than 30%) in countries that suffered from civil war and political instability during the last decades (e.g., Haiti, Somalia, Ghana, Sierra Leone, and Lebanon) and is particularly strong in Central America and Sub-Saharan Africa".

The proliferation of corruption, bribery, and nepotism in most of the Arab countries. They negatively influence all areas of life and deplete the level of services such as education, healthcare, infrastructure etc. A study on relationship between emigration and corruption by Cooray and Schneider [4: 18] revealed that "If corruption in a country increases, the emigration rates of those with high levels of educational attainment also increase". Corruption might affect net migration through two channels: first, it might favour outflows by pushing highly skilled natives to migrate to other less corrupt countries; and second, it might hamper inflows by discouraging talented foreign workers from immigrating [19: 0.503]. While [5: 1274] examined the impacts of corruption on migration for a panel of 111 countries between 1985 and 2000. The empirical results indicate that corruption especially drives skilled migration. According to the Corruption Perception Index 2023, issued by Transparency International, on a scale from 0 to 100; where 0 refers to the highest level of corruption, the rates of all Arab countries were below 50, except for the United Arab Emirates, Qatar, and Saudi Arabia.

Level of scientific research and lack of vacancies in some scientific and technological fields may also be a problem. "Some scientists suffer from the absence of

Table 3 Perception of individual well-being in Arab countries compared to the very high human development group

	Education quality % satisfied 2014–2015	Health care quality % satisfied 2014–2015	Standard of living % satisfied 2014–2015	Mandatorily paid maternity leave days 2015	Old-age pension recipient (% of statutory pension age population) 2004–2013
Very high human development	64	68	71	114	90.4
Arab countries	49	44	67	73	36.6

Source [22]. Human development report 2016. Human development for everyone, New York[1]

certain discipline that conforms to their educational qualifications such as atomic science, rocket industries, and space" [13].

3.2 External Incentive Factors

Developed countries can provide better possibilities for work and scientific research. Therefore "one of the reasons of skilled migration is the availability of scientific research in the destination countries, either that related to the prevailing scientific research climate or physical capabilities such as laboratories, funding, research teamwork" [18].

Better individual well-being and social security services in developed countries than Arab countries. Table 3 shows the perception of individual well-being in Arab countries compared to the very high human development group.

Table 3 shows a decrease in individual well-being and social security indicators of the Arab countries compared to the very high human developed group which include OECD countries. In fact, there is a significant disparity in the percentage of statutory pension age population and Mandatory paid maternity leave days between Arab countries and OECD countries. At the same time, the average of Mandatory paid maternity leave days in the very high human developed group including OECD countries (114 days) which were much better than the average of Arab countries (73 days). The same is true for individual well-being it is better and more satisfied in a very high human developed group than Arab countries.

[1] Data is taken from two tables no 11 & 14 of the mentioned source.

4 The Impacts of Skilled Migration (Brain Drain)

Skilled migration from Arab countries is something that cannot be ignored. The Arab countries appear to suffer more from brain drain than other countries. "The expatriation rate among the highly educated is higher in the Middle East and North Africa (9.1%) than in Latin America (8.3%), East Asia and Pacific (7.7%), and Eastern Europe and Central Asia (4.1%)" [23: 22].

One of the most negative effects of skilled migration is the loss of scientific and productive power of Arab minds, at the time the Arab countries need such competencies in the fields of economy, education, health, planning, scientific research, and technology [18].

This becomes more of a threat when we take into account the fact that the investments of Arab countries in highly skilled migrants are lost as those people leave their countries and become assets in the destination countries. These losses become especially clear and influential when we trace the movement of skilled people working in the health and the higher education sectors. The number of workers in the health sector in (OECD) countries who were born outside the countries of residence increased to 1.7 million people including about 712 thousand nurses, and about 422 thousand doctors. At the same time the number of Arab-born highly skilled residents in (OECD) countries was more than one million. [15: 65].

Although high-skilled migration is a loss for the home country, there are several forms to involve them in the development process of their origin countries: remittances, experts, and academic visits which imply transfer of knowledge and experience, investments and so on. Generally, participation and involvement of migrants in development in their homeland become easier as a result of globalization and technological progress.

Remittances are one of the main benefits received by the origin countries as a result of the migration. Remittances inflows constitutes a significant aspect of the Arab Countries economies. According to UNDP report (2011) The Arab region considers one of the biggest receiving countries for remittances as a percentage of GDP. Where the ratio of remittances to the GDP was 2.2%, and in North African countries this percentage raised to 3–3.5%, which is considered one of the highest ratios in the world" [16: 34]. As for example, the Egyptian remittances in 2017 were $ 17.0 billion, and ranked 6th among the top remittance receiving countries in 2017. It represents about 6.4% of its GDP. Indeed, Egypt received remittances more than foreign direct investment (FDI) which represent 3.14% of its GPD [14: 10].

Despite the debate over the role of remittances to help the poor families, their macroeconomic impact seems clear. Remittances by highly-skilled migrants to their family or relatives can replenish the stock of human capital that may have been depleted in the home country by the brain drain. Some estimates confirmed that the increase in remittances by about 10% leads to an average reduction of poverty by about 3.5% [14: 29]. The largest proportion of these remittances to the Arab countries was used to meet the needs of immigrant families and improve their welfare. Sometimes they were invested or used for entrepreneurial purposes.

5 Conclusion

Skilled migration is an international phenomenon that affects mostly developing countries, including the Arab countries. However, it is equally important to mention that there is a high percentage of Arabs living abroad, and they have emigrated or been displaced as a result of political and economic conditions. These migrations included large segments of young people and scientific talents who left their homeland as a result of the lack of job opportunities, high unemployment rates and the deterioration of the political situation in the Arab countries.

Like any other human phenomenon, skilled migration has a negative and positive impact. The cost is very high when we compare it with the yields and benefits. Remittances are one of the main benefits for the Arab States, but unfortunately, most of these remittances were used for consumption, for family purposes and welfare. The redirection of remittances towards investment rather than consumption is likely to contribute to improving the condition of services and the labor market in the Arab countries, this will positively affect the welfare of the citizen.

Generally speaking, migration has become more complicated and diverse; therefore, it is not easy to control its characteristics and trends. Obviously, skilled migration is continuously increasing, which may jeopardize the future of the origin countries and the quality of services provided to the citizens, such as educational services and health care. Governments should manage this profile wisely in order to keep their highly skilled people and minimize the negative impacts of brain drain. Policies that can be carried out by the Arab countries, may include Strengthening the institutional structure and encourage scientific research through the allocation of adequate budgets for scientific research projects at universities and research centers. Encouraging circular migration and promote cooperation and networking between communities abroad and their home country is another important approach that may be adopted. Diaspora associations can play a crucial role in strengthening relations between immigrants themselves and between them and their homeland. Therefore, supporting these associations and establishing good relations with them is crucial in attracting highly skilled people and involving them in development at home. Political and administrative reforms may be a catalyst that may reduce the desire of young people, especially the highly skilled, to emigrate. At the same time, these reforms encourage highly skilled immigrants to return to their countries of origin.

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The Presumptive Validity of Virtual Attorney Between Islamic Jurisprudence and Law



Somoud Z. A. Abualhwar, Suhail Al-Ahmad, and Omar Al-Makhzoumi

Abstract This research addresses one of the most important topics of the modern era, which is the technological advancements extending into various fields of work. The research specifically discusses the concept of the virtual lawyer, elucidating its definition, exploring its emergence, and subsequently discussing the validity of the activities performed by virtual lawyers. Furthermore, it delves into the application of virtual lawyer provisions in both Arab and European countries.

Keywords Virtual lawyer · Lawyer website · Virtual office · Human capital theory

1 Introduction

The observer of issues concerning technological advancements in the legal and judicial domain finds that they have recently encompassed all the requirements of legal and judicial work. Within this development is the inclusion of trial parties, notably the lawyer, leading to the emergence of the concept of the virtual lawyer prominently in recent years. This research aims to address this issue from a specific and defined perspective: the validity of the virtual lawyer under the title "The Validity of the Virtual Lawyer between Islamic Jurisprudence and Law".

Technological advancement and the rush towards it have become a hallmark of the modern era, and the field of judiciary and justice has not been isolated from this progress. One of the most discussed topics lately among judicial authorities and lawyers alike is the concept of electronic litigation. While this discussion was

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prevalent and confined to research sites in many countries before, it became a global conversation after the occurrence of the COVID-19 pandemic. Therefore, I chose the title of the research because it discusses one of the parties to litigation, which is the lawyer [1–8].

It is well known that the lawyer is the advocate for citizens' rights, given the effort they exert. Hence, the perennial question arises: does the work of the virtual lawyer equate to that of a lawyer in physical courts? Moreover, what is the validity of the virtual lawyer in presenting evidence? These are the questions I will attempt to answer in this research.

The importance of this research is underscored by the following aspects:

1. Addressing a newly emerging topic of utmost significance.
2. Validity of evidence in this matter, given that the modern trend explicitly leans towards electronic virtual litigation.
3. Forming a comprehensive understanding of the practical reality of virtual litigation and the role and validity of virtual lawyer activities in countries implementing this system.

The reasons for choosing this research are as follows:

1. The novelty of the topic in its entirety, with a lack of specialized research available on the subject.
2. The seriousness of the topic, given that the modern trend explicitly relies on electronic virtual litigation.
3. Providing a comprehensive explanation of the concept of virtual litigation initially and elucidating the concept of the virtual lawyer.
4. Forming a general overview of the practical reality of virtual litigation and the role and validity of virtual lawyer activities in countries implementing this system.

The research attempts to address the following main question: What is the validity of the virtual lawyer in Islamic jurisprudence and law? This question branches out into several sub-questions, as follows:

1. What is meant by virtual litigation and the virtual lawyer?
2. What is the validity of the virtual lawyer in Islamic jurisprudence?

What is the validity of the virtual lawyer in law?

3. Which countries implement the system of virtual litigation?

The research aims to:

1. Clarify the concept of the virtual lawyer in both law and Islamic jurisprudence.
2. Form a clear understanding of the emergence of this term worldwide.
3. Elucidate the extent of validity of the virtual lawyer in both law and Islamic jurisprudence.
4. Explain the extent of application of the concept and identify the countries where it is implemented.

Research Methodology:

In order to achieve the desired goal of selecting the topic and outlining its theoretical framework, I will adopt a descriptive analytical approach in writing and formulating the research. This approach will be utilized in studying the legal and Sharia provisions related to the validity of virtual lawyers, bridging Islamic jurisprudence and law.

Previous Studies: There are no prior studies addressing the rulings of this research in terms of the validity of virtual lawyers.

2 The First Topic: Concept of Virtual Lawyer and the Origin of the Term Worldwide

The first requirement: The Concept of the Virtual Lawyer in Law and Islamic Jurisprudence.

Subsection One: The Concept of the Virtual Lawyer in Law.

It is worth mentioning that Palestinian law and the laws applied in Palestine generally do not encompass the concept of the virtual or digital lawyer. This is quite evident, as virtual lawyering is not practiced in Palestine, nor has it ever been discussed before the relevant authorities. Therefore, there is no Palestinian legal definition for the digital lawyer.

Among the terms apparent in the legal aspect is the definition provided by the Moroccan writer and thinker, Khamis Al-Fadili, who describes the electronic lawyer as one who provides consultation services via the internet and social networks, and interacts electronically with their clients without the need for face-to-face meetings. Additionally, they engage in legal procedures with the courts through electronic means, placing them within the realm of digital justice and making them essential actors in it. The mechanisms of the modern age have imposed this reality, leaving no room to swim against the tide [9].

As for European and Western legislation in countries where virtual lawyering is practiced, such as the United States, regulations have been introduced to govern specific aspects rather than comprehensive legislative regulation. These regulations typically come through the American Bar Association (ABA), which provides assistance tools for lawyers to submit applications and offer legal consultations without the necessity of physically visiting lawyers' offices or courts (Al-Fadili).

Subsection Two: The Concept of the Virtual Lawyer in Islamic Jurisprudence.

The provisions of Islamic jurisprudence completely lack the concept of virtual lawyering, thus clearly falling short in recognizing the importance of technological advancements in the justice sector. Consequently, there is a deficiency in Islamic legal rulings regarding virtual lawyering or virtual litigants. However, it is noted that the Shafi'i school of thought has addressed the concept of virtual jurisprudence, not virtual litigation, considering it an integral part of Islamic jurisprudence since it relies on assumptions to establish legal rulings based on assumed scenarios. Nonetheless,

what the Shafi'i school meant by its interpretation of the concept of virtual jurisprudence does not meet the requirements of the concept of virtual litigation ("The Imam and the Jurist" website) [13].

Here, we delve into prominent contemporary articles on virtual lawyering, comparing the concept of virtual lawyering to that of traditional lawyering and how it can be performed through virtual reality. In this context, when we assess the concept of lawyering in Islamic jurisprudence, lawyering means: entrusting a specialized individual to provide legal assistance, either as a plaintiff or a defendant, before the competent court, for a known fee, subject to representation by someone other than the client upon their death. Therefore, this delegation extends to virtual digital lawyers filing requests and submissions to help preserve the rights of their clients on their dedicated website, thereby achieving the legal definition.

The second requirement: The origin and source of the term "virtual lawyer" in the world and its emergence.

Subsection One: Source of the term "virtual attorney."

Based on the fact that an attorney is one of the parties of justice, it is necessary to trace the origin of the term back to the emergence of lawyering in ancient law, such as Roman law. The practice of law was not confined to one task in Rome but was divided into two branches according to the nature of each task: legal counsel, which was for the jurist, and advocacy, which was for the orator. The source of the term "attorney" comes from the convergence of the two roles: the attorney from the "hama" (legal counsel) and "hima" (advocacy), where legal counsel and knowledge are found.

The virtual attorney's source stems from digital lawyering itself, as it provides counsel and knowledge through its website and specialized automated system. Therefore, it can be argued that the source of the virtual attorney is the same, but the difference lies in the method of providing legal counsel, ranging from oral advice to standardized responses tailored to specific circumstances.

Subsection Two: The emergence of the virtual attorney.

The emergence of the virtual attorney is linked to the advent of digital justice, which utilizes information technology to access justice and facilitate communication between parties to a lawsuit and all stakeholders in the legal system and judiciary. The inception of this idea can be traced back to 1999 in the United States, specifically in the field of electronic commerce disputes, through the use of the internet and virtual litigation software.

Subsequently, countries adopted this concept in commercial domains, such as China, where an electronic court was established relying on sophisticated computer software that stores all applicable laws, regulations, and precedents. Cases are initiated by both defense and prosecution preparing their data and claims on two identical compact discs. These discs are then entered into the computer program for examination and judgment by the electronic judge (Mohammad).

Indeed, countries have begun implementing this approach, and it can be said that the trend towards having virtual attorneys, who own websites and respond to consultations through artificial intelligence systems, and submit requests based on the prevailing circumstances, has been adopted [10].

3 The Second Topic: The Presumptive Validity of Virtual Lawyers Between Islamic Jurisprudence, Law, and the States Implementing Virtual Litigation Rulings

The first requirement: The validity of virtual lawyers between Islamic jurisprudence and the law.

Subsection One: The validity of virtual lawyers in Islamic jurisprudence.

The validity of virtual lawyers in Islamic jurisprudence encompasses both their existence and the legitimacy of the consultations and initial requests they provide regarding their legal validity. Islam aims to achieve benefits and prevent harm; thus, it generally accepts the validity of a lawyer's representation even if there isn't a specific text addressing virtual lawyers. This is based on the principle that the rightful person should be able to prove their rights without infringing upon the rights of others. Consequently, Islamic law allows advocacy or defense in litigation under the concept of agency in litigation.

Regarding the validity of evidence, Islamic law clarifies that all efforts made by a lawyer to prove the truth through legitimate means are considered valid evidence. This includes both testimonial and written evidence, such as in debt transactions. The validity of virtual lawyers is established through their requests and the acceptance of their objections, and it is considered valid unless it contradicts a legal ruling.

The First requirement: presumption of attorney-client privilege in law.

While there is no specific legislation regulating the activities of virtual lawyers in Palestine, it can be inferred from the joint efforts of the Supreme Judicial Council and the Palestinian Bar Association, as demonstrated through the adoption of the 'Meezan 2' program and application. This program is an integrated electronic system for managing civil and criminal lawsuit processes, overseeing all procedures related to the lawsuit from its registration with the court clerk until its final resolution. This includes issuing notifications to the parties involved, printing session minutes, saving and storing them, printing various correspondences by order of the presiding judge, and monitoring lawsuits. This indicates the Palestinian judiciary's inclination towards a virtual electronic litigation system.

The concept of the virtual lawyer emerged from the perspective of electronic requests that lawyers submit to their clients through this virtual platform. While the request is technically submitted by the lawyer, it aligns with the general idea of virtual lawyering. Additionally, some law offices and pages already provide electronic consultations, such as the office of Lawyer Tamer Qahima in Palestine. Considering that courts readily accept such requests, it serves as evidence of the validity of the activities performed by virtual lawyers [11, 12].

The second requirement: The countries implementing virtual litigation and digital lawyers and comparing the work of virtual lawyers to that of lawyers in physical reality.

Subsection One: The countries implementing virtual litigation and digital lawyers.

The United States leads the list of countries implementing virtual lawyering, as according to the guidelines of the American Bar Association, virtual law practice

specifically entails providing legal services online through a section of a law firm's website known as the secure client portal. The law firm must have a secure section on its website where clients can log in using a username and password. By 2014, there were at least 15 virtual law firms in the United States since the inception of the concept of virtual litigation in 1999 [14].

In terms of Arab countries, the United Arab Emirates (UAE) has been at the forefront of adopting remote litigation. The Ministry of Justice in the UAE launched remote litigation services in 2019 under a decision issued by the Minister of Justice, which applies to federal courts.

Subsection Two: A comparison between the work of a virtual lawyer and the work of a lawyer in real life.

Although advancements have been made to contribute to resolving legal issues and alleviate the burden and backlog of judicial files, introducing concepts like virtual litigation, digital lawyers, and virtual lawyering, the core of these innovations lies in the concept and presence of the digital lawyer merely assisting in providing legal consultations and electronic submissions based on what the actual lawyer inputs on this platform. Therefore, its reliance heavily and explicitly remains on the actual lawyer.

This is natural because each legal case is associated with different causes or amendments, leading to varying judgments and proofs of rights, thus emphasizing the necessity of human intellect capable of analysis and inference, rather than simply providing a fixed answer for all circumstances without scrutinizing their facts.

4 Conclusion

Search Results:

1. Palestinian legislative shortcomings are also paralleled by the absence of the concept of virtual litigation and digital lawyering in Islamic jurisprudence.
2. The United States and China lead in the field of virtual justice.

5 Recommendations

1. Conduct the necessary discussions for the purpose of legislating and implementing virtual litigation systems in Palestine, in collaboration with both the Supreme Judicial Council and the Palestinian Bar Association. Additionally, provide a recommendation for issuing a law to regulate its provisions properly, given the availability of a system similar to the general concept of the balance system.
2. Scientific connection with European countries and further investigation into the issue of virtual lawyering.

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The Impact of AI on Customer Service and Financial Decision-Making: The Perceptions of Bank Clients



Islam Abdeljawad, Muiz Abu Alia, Taimaa Kharoub, and Sireen Abulrub

Abstract This study explores the impact of artificial intelligence (AI) technologies on customer service quality, financing decisions, and investment decisions among Palestinian bank clients. Using Partial Least Square analysis and leveraging data collected from 375 respondents representing banks clients using online convenience sampling, the findings reveal that AI enhances the efficiency of internal operations within banks through smarter and faster data analysis. Moreover, AI contributes to an improved customer experience by enabling personalized banking services tailored to individual needs, thereby enhancing satisfaction and fostering loyalty. Additionally, AI aids clients in making informed financing and investment decisions. The study underscores the importance of AI in banking, recommending the development of comprehensive digital transformation strategies, partnerships with technology companies, and measures to strengthen data security and protection. Overall, AI technologies represent a crucial strategic addition to banking, driving operational efficiency, customer satisfaction, and financial decision-making.

Keywords Artificial intelligence · Bank clients · Financial decisions · Customer satisfaction · Palestine

1 Introduction

The rapid advancements in smart technologies, particularly Artificial Intelligence (AI), have profoundly influenced the finance and financial markets in recent decades [1]. AI technologies such as machine learning, natural language processing, and big data analysis have become indispensable components of the banking and financial sector, enhancing performance by guiding investments, analyzing markets, and improving overall financial operations [2–4]. Originally designed for efficient logical operations, AI has evolved to outstrip human intelligence in speed and proficiency.

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Tools like financial robots, neural networks, and deep learning are pivotal in this transformative process [5].

AI technology is programmed to emulate human judgment and cognitive skills, autonomously learning from data to make decisions, predictions, and assessments. It interprets environmental cues and risks, evolving with new data [6]. Particularly effective in real-time analysis of unstructured digital, textual, and visual data, especially within the context of big data, AI aids in focusing on critical areas [7].

Therefore, AI technology significantly impacts various industries, especially finance, by enhancing data analysis speed and accuracy, leading to improved investment decisions and market trend predictions [8]. It is pivotal in sectors from health to space exploration, reducing human error and operational costs, thereby increasing profitability [2]. In banking, AI improves customer services, personalizes financial advice, streamlines credit operations, and enhances risk control. AI also aids in portfolio management and investment decision-making [9]. However, challenges like security, privacy, regulatory compliance, and technical obstacles need to be addressed, necessitating strategies for data protection and legal compliance [10].

AI-based fintech significantly reduces information asymmetry, enhancing information disclosure, and enabling more efficient credit risk assessment with big data. Studies highlight AI's role in easing financing constraints for non-state-owned enterprises and extending understanding of corporate financing constraints, traditionally focused on factors like bank market power, stock market liquidity, financial liberalization, and entrenched management practices [11].

Despite the potential for significant improvements in banking services and the financial industry, the slow advancement of artificial intelligence in Palestinian banks presents challenges. Concerns include the quality of AI systems, which can suffer from poor results due to bad or unknown data, and privacy issues related to safeguarding protected data against unauthorized access. Additionally, there are management challenges in integrating and trusting AI technology within business structures. While there's uncertainty about AI's real-life impact, the overall belief is that its benefits outweigh the potential negative effects [4, 12].

The integration of AI in customer service and financial decision-making within banks has revolutionized client experiences. AI-powered chatbots provide swift, personalized assistance, enhancing customer satisfaction and loyalty. Through data analysis, AI algorithms offer tailored financial advice, aiding clients in making informed decisions aligned with their goals and risk tolerance. Moreover, AI-driven fraud detection systems bolster security measures, instilling trust among clients [13]. This convergence of AI technologies optimizes operational efficiency, reduces costs, and ensures a seamless banking experience, ultimately empowering clients with greater control over their financial endeavors [10].

This study posits the following question: How do bank clients perceive the impact of AI advancements on financial decisions and customer service? In general, this study highlights the perception of bank clients about AI's role in improving customer service, financing decisions, and investment decisions. The implications of these results include enhanced operational efficiency, personalized banking services

increasing customer loyalty, competitive differentiation in the financial market, improved financial risk management, and crisis forecasting.

The study contributes to the literature by providing evidence from a new setting. Palestine is an underdeveloped country with political instability [14–16]. All sectors, including banks, were affected by the restrictions of the Israeli occupation [15, 17–19]. Banks play a crucial role in Palestinian business activity [20].

2 Literature Review

The literature on AI and Fintech highlights the integration of big data, AI, digital payments, cloud computing, and blockchain in finance and banking [21]. Applications include using big data for new business models and market analysis tools [21], blockchain for credit rebuilding and market efficiency [22], digital payments for cost reduction and new benefits [23], and AI for investment decisions [24]. Hassabis et al. [25] also note the potential insights from neuroscience in developing intelligent machines, underlining the connection between AI and human neural processes.

Saber et al. [26] highlights the utility of AI in banking and financial institutions through the development of 'robo-advisors'. These advisors assist users in making financial decisions, such as personal financial management, and are evolving to cover financial analysis, asset allocation, insurance underwriting, forecasting, and reporting, capitalizing on their speed and accuracy. Dirican [27] broadens AI research to include areas like robotics, mechatronics, big data, data mining, cloud computing, and neural networks, highlighting their importance in future banking and financial services trends.

Bharadiya [28] suggest using machine learning techniques such as Support Vector Machines and Artificial Neural Networks for cryptocurrency price analysis, which could optimize financial decision-making and potentially yield higher returns, especially in Bitcoin trading, by exploiting short-term informational inefficiencies. Kim [29] used an abductive learning network AI to analyze market value added (MVA) determinants, achieving an 88% explained variance, notably outperforming traditional regression methods where 29% variance explained. Kerkez [30] posits that AI can revolutionize labor use in banking by streamlining routine tasks like compliance reporting, potentially reducing labor costs which make up a significant portion of banking expenses. AI also assists in risk mitigation by detecting patterns, but may struggle with emerging risks. However, the rise in false-positive alerts necessitates ongoing system updates to reduce manual oversight.

The literature indicates that AI technologies in the banking sector enhance direct crowdfunding for entrepreneurs and organizations via online platforms [31]. Additionally, AI improves credit information systems, reducing information asymmetry between borrowers and lenders [32].

2.1 Artificial Intelligence

The advancement of AI has profoundly impacted various fields, particularly financial accounting and administration, by automating tasks, increasing efficiency, and reducing errors, thus transforming the financial and banking sectors [33, 34]. AI amalgamates disciplines such as physiology, computer science, and linguistics to simulate human intelligence in computers, enabling them to handle complex decision-making and routine tasks [35]. AI systems, which learn and self-improve over time, are programmed to mimic human judgment and cognitive skills, thereby assessing risks and making decisions. The widespread integration of AI in everyday technology and its ability to process vast data beyond human capacity are also noted [36].

Financial decision making is an essential function in all types of firms [37]. Naturally, AI stands as a transformative technology in the finance sector, enhancing business efficiency and financial decision-making accuracy in banks and for customers [9]. Despite its benefits, AI also presents challenges in security, privacy, and the necessity for appropriate regulatory frameworks [34].

AI technologies. AI provides a set of technologies like neural networks, deep learning, and machine learning beneficial in decision-making in banking sector [33].

Expert Systems. Expert Systems (ESS) serve as platforms for sharing expert knowledge across various fields, helping bridge knowledge gaps and providing user support [38]. They have been shown to significantly increase profits, especially in decision support systems that combine linear programming with rules-based AI. Historically, expert systems primarily used symbolic processing. Acquiring knowledge in complex domains like finance and accounting is challenging, necessitating tailored methods for effective knowledge extraction, such as observation, interviews, or practical tasks [39].

Machine Learning. Machine Learning (ML) in finance involves systems learning from data to make decisions, encompassing supervised, unsupervised, and reinforcement learning. Reinforcement learning is notably effective in securities trading for portfolio rebalancing [40]. The financial sector is increasingly focusing on AI, with research differentiating between ML, robotic process automation, and AI. AI and ML enhance banking operations in customer relationship management, fraud prevention, and regulatory compliance [41]. Additionally, ML transforms corporate real estate by digitizing and analyzing complex contracts and is used in financial markets for online portfolio selection [42].

Natural Language Processing. Natural Language Processing (NLP), crucial in AI, enables systems to understand and process human language, applicable in various domains [43]. In banking, NLP improves services and financial decision-making by analyzing financial reports and news, aiding in investment strategy, and enhancing customer service with automated interactions [44]. It also assists in predicting market trends and managing risks through news monitoring and financial risk reporting. Its

significance in banking, particularly in data analysis and customer communication, leads to improved financial decisions [2].

Neural Networks. Artificial Neural Networks (ANNs), inspired by the human brain, excel in pattern recognition and data analysis through parallel processing. Evolving from regression model extensions in finance, ANNs now demonstrate superior generalization and self-organizing abilities. Deep learning, a multi-layered neural network approach, enhances intuitive learning but may lack interpretability [45]. In finance, ANNs have improved asset return predictions and are used for handling large datasets, predicting market trends, and portfolio management [46]. They also enhance customer service through automation and support risk management by providing accurate market forecasts.

2.2 The Application of AI in Banks

AI technology stands as one of the most crucial developments of the twenty-first century, significantly impacting various industries, including the financial sector. Within banks, AI is reshaping operations across several key areas:

Financial Risk Management. AI is revolutionizing financial risk management within banks by swiftly and accurately analyzing data to identify unusual behavior and mitigate risks. Major banks are increasingly leveraging AI to enhance risk assessment processes, ensuring financial stability and regulatory compliance [13].

Furthermore, AI empowers banks to enhance their risk management practices by enabling swift and accurate identification of potential risks and anomalies. AI algorithms analyze vast amounts of transactional data in real-time to detect suspicious activities and identify emerging risks, such as fraud and money laundering. Additionally, AI-powered predictive models assess credit and market risk, enabling banks to proactively manage their exposure to potential losses [13].

Customer Experience. AI-driven solutions are enhancing customer experience in banks by providing quick responses to inquiries and delivering personalized financial advice [47]. By leveraging AI technologies, banks can improve customer services, leading to higher satisfaction and loyalty among clients [48].

Investment Decision-Making. AI plays a pivotal role in optimizing investment decisions for banks by improving the accuracy of market forecasts and data analysis. Studies demonstrate how AI, particularly deep machine learning, aids in forecasting investor sentiment and asset pricing, enabling better managerial decisions and high-frequency asset pricing forecasts [49].

Performance of Financial Assets. Banks are utilizing AI technologies to improve the performance of their financial assets through enhanced investment portfolio management and smart investment decisions [47]. By leveraging AI-generated indicators

and predictive analytics, banks can optimize returns on financial assets and drive sustainable growth.

Financing Decisions. AI assists banks in making informed financing decisions by providing predictive analytics and real-time insights into borrowers' financial health and market conditions. Machine learning algorithms analyze historical data to identify patterns and trends, enabling banks to assess the viability of loan applications and predict borrowers' ability to repay loans accurately [32].

2.3 Hypotheses of the Study

AI technologies have significantly transformed the banking sector, enhancing customer service by efficiently analyzing large volumes of financial data. This analysis helps banks better understand customer needs and preferences, leading to more personalized and interactive services. As a result, customer experience and satisfaction are improved, fostering stronger relationships and loyalty between customers and banks, and increasing the efficiency of investment and financing decisions [41]. We hypothesized the following:

H1: The degree to which bank clients perceive intelligent technologies positively correlates with their perception of customer service quality.
H2: Bank customers perceive their financing decisions more favorably the more perceived intelligent technologies they employ.
H3: Bank customers perceive their investment decisions more favorably the more perceived intelligent technologies they use.

3 Methodology

This study employed a convenience sampling method to gather data from clients of Palestinian banks [17, 50]. A questionnaire, developed by the researchers, aimed to measure the variables of interest in this study. Details of the questionnaire items can be found in the appendix.

A total of 400 responses were collected through an online questionnaire, out of which 375 were considered valid for analysis. The characteristics of the sample are outlined in Table 1.

Table 1 Sample characteristics

Percentage (%)	Categories	Characteristics
44.8	Male	Gender
54.7	Female	
58.9	Less than 30	Age (years)
40.5	30–40	
0.5	40–50	
0	More than 50	
11.7	Diploma	Qualification
63.2	Bachelor's	
23.2	Master's	
0.5	Ph.D	
1.3	Other	
15.2	Daily	How many times do you interact with the online bank's services?
30.7	Weekly	
29.1	Monthly	
25.1	Less than once a month	
87.7	Yes	Have you preferred to use online banking services recently?
12.3	No	

4 Results

We employed partial least squares (PLS) modeling with Smart-PLS 4 [51] as our chosen statistical tool to scrutinize both the measurement and structural model. PLS modeling was preferred due to its robustness against assumptions of normality, which is particularly advantageous in the context of survey research where data distribution may not adhere to normality [51, 52].

As data stemmed from a singular source, we undertook an assessment of Common Method Bias, as recommended by Nour et al. [53] and Kock [54], by conducting tests for full collinearity. All variables were regressed against a common variable, and a Variance Inflation Factor (VIF) threshold of ≤ 3.3 was set to ascertain the absence of bias stemming from the single-source nature of the data. VIF values, in Table 2, indicate that single-source bias was not a significant concern within our dataset.

Table 2 Full collinearity testing

AI usage	Customer service	Financing decisions	Investment decisions
1.068	1.909	2.574	2.187

4.1 Measurement Model

We adhered to the methodology of Anderson and Gerbing [55] to assess the developed model through a 2-step procedure. Initially, we scrutinized the measurement model to evaluate the validity and reliability of the utilized instruments, in accordance with the guidelines provided by Hair et al. [56]. Subsequently, we conducted an analysis of the structural model to examine the formulated hypotheses.

In evaluating the measurement model, we assessed the loadings, average variance extracted (AVE), and composite reliability (CR). It was stipulated that loadings should surpass 0.5, AVE should be equal to or greater than 0.5, and CR should be equal to or greater than 0.7. As illustrated in Fig. 1 and Table 3, all AVE values exceeded 0.5, and all CR values surpassed 0.7. Additionally, the loadings were deemed acceptable, with only four loadings falling below 0.708 [56] but larger than 0.5.

In the subsequent step, we evaluated the discriminant validity utilizing the HTMT criterion proposed by Henseler et al. [57] and later refined by Franke and Sarstedt [58]. According to this criterion, HTMT values should not exceed 0.85 under the stricter criterion and should not surpass 0.90 under the more lenient criterion. As depicted in Table 4, all HTMT values were below 0.90. Consequently, we can infer that respondents perceived the four constructs as distinct. Collectively, these validity tests affirm the validity and reliability of the measurement items.

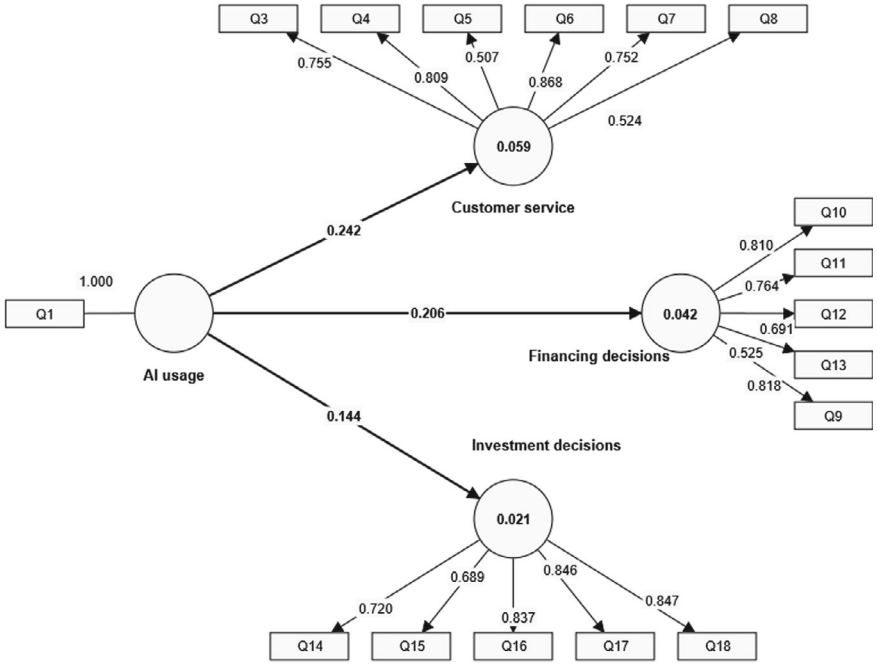


Fig. 1 Loadings of the measurement model

Table 3 Measurement model

Construct	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Customer service	0.806	0.817	0.513
Financing decisions	0.797	0.835	0.532
Investment decisions	0.849	0.865	0.625

Table 4 Discriminant validity using Heterotrait–Monotrait criterion (HTMT)

Construct	1	2	3	4
1. AI usage				
2. Customer service	0.242			
3. Financing decisions	0.194	0.849		
4. Investment decisions	0.150	0.750	0.890	

4.2 The Structural Model

Following Hair et al. [56], we conducted an assessment of multivariate skewness and kurtosis. The findings indicated that the collected data did not adhere to multivariate normality, as evidenced by Mardia's multivariate skewness ($\beta = 4.8195, p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 33.5428, p < 0.01$). Consequently, in line with the suggestions of Becker et al. [59], we employed a resample bootstrapping procedure with 10,000 samples to report the path coefficients, standard errors, *t*-values, and *p*-values for the structural model as in Fig. 2 and Table 5.

Additionally, considering the critique by Hahn and Ang [60] regarding the limitations of relying solely on *p*-values for hypothesis testing, we integrated a combination of criteria including *p*-values, confidence intervals, and effect sizes. Table 5 provides an overview of the criteria utilized to evaluate the developed hypotheses.

The initial analysis focused on examining the influence of the AI predictor on Customer Service, revealing an R^2 of 5.9%, indicating that this predictor accounted for 5.9% of the variance in Customer Service. Similarly, R^2 values of 4.2 and 2.1 were observed for Financing Decisions and Investment Decisions, respectively. Positive relationships were identified between AI and Customer Service ($\beta = 0.242, p < 0.01$), Financing Decisions ($\beta = 0.206$, $p < 0.01$), and Investment Decisions ($\beta = 0.144$, $p < 0.01$), thus supporting hypotheses H1, H2, and H3. Furthermore, bias-corrected 95 confidence intervals did not encompass zero, affirming the robustness of our findings.

In summary, the impact of AI on customer service and financial decisions of bank clients is substantial, as evidenced by our findings. Following rigorous methodological protocols outlined by Hair et al. [56] and Becker et al. [59], our study revealed that AI has a positive influence on customer service, financing decisions, and investment decisions among Palestinian bank clients. Specifically, AI was found to explain 5.9% of the variance in customer service, with similarly positive effects observed

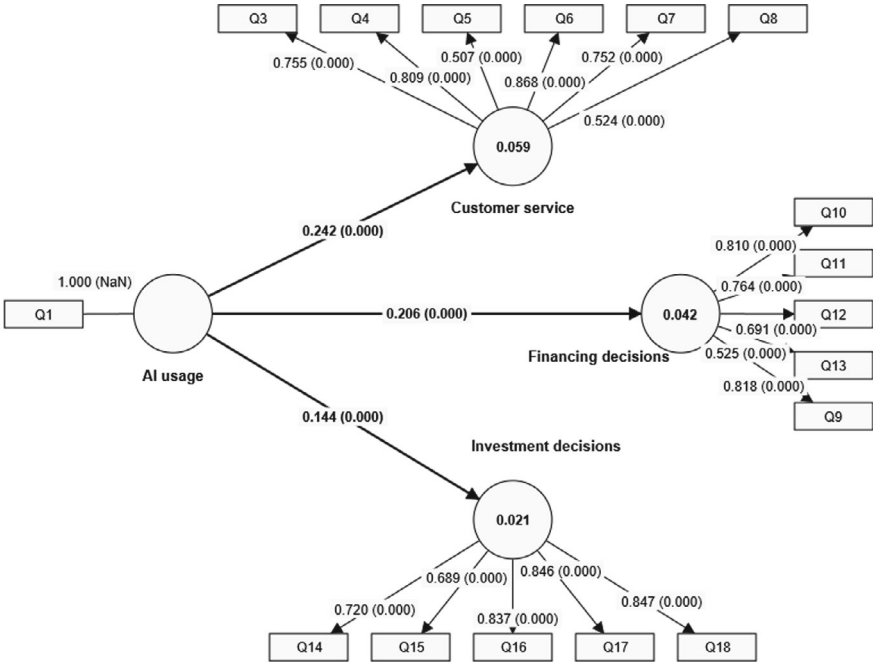


Fig. 2 The structural model

Table 5 Hypothesis testing

Hypothesis	Relationship	Std Beta	Std Error	*t*-values	*p*-values	BCI LL	BCI UL	f2
H1	AI usage— > Customer service	0.242	0.041	5.875	0.000	0.168	0.302	0.062
H2	AI usage— > Financing decisions	0.206	0.039	5.290	0.000	0.133	0.259	0.044
H3	AI usage— > Investment decisions	0.144	0.040	3.622	0.000	0.074	0.2	0.021

Note We use 95 confidence interval with a bootstrapping of 10,000

on financing decisions ($R^2 = 4.2\%$) and investment decisions ($R^2 = 2.1\%$). These results, supported by robust statistical analyses, underscore the increasingly integral role of AI in shaping and enhancing banking services and decision-making processes.

5 Conclusion

The study underscores the significant impact of AI technologies in the financial sector, particularly in enhancing the efficiency of internal operations within banks. This improvement is primarily achieved through the smarter and faster analysis of big data, leading to increased processing speed and seamless integration of AI technologies into everyday banking operations.

Moreover, our findings demonstrate that the utilization of AI in banks has a positive effect on enhancing customer experience. By leveraging smart systems to analyze customer behaviors and anticipate their needs, banks can offer personalized banking services, thereby enhancing satisfaction and fostering loyalty among clients.

Furthermore, the study highlights an additional benefit of AI to clients in their financing and investment decisions. AI-enabled tools provide valuable insights and support in making informed financial decisions, contributing to better financial outcomes for clients.

Future research endeavors should focus on exploring additional benefits of AI in banking, particularly in enhancing security and anti-fraud measures. AI employs machine learning models to detect unusual patterns, offering early warnings against suspicious activities and reducing fraud risks, thus bolstering overall security.

Overall, AI technologies represent a crucial strategic addition to banking, improving operational efficiency, customer experience, and security. These advancements align with the broader digital transformation in banking, emphasizing the necessity to adopt advanced technologies to remain competitive and enhance financial services.

Based on the results, the researchers recommend the following actions:

1 Develop comprehensive digital transformation strategies incorporating AI, tailored to the bank's goals and market challenges.
2 Strengthen partnerships with technology companies to gain access to advanced AI developments and support.
3 Enhance data security and protection to bolster customer confidence and guard against cyber threats.
4 Create custom AI-driven solutions to enhance customer experience through personalized services.
5 Increase employee awareness and training on AI technologies for effective organizational integration.
6 Utilize AI-powered big data analysis for strategic decision-making to boost efficiency and profitability.
7 Engage with AI-related legislation and ethics to mitigate legal and ethical risks associated with AI implementation in banking operations.

Appendix

Thank you for participating in our survey! Your feedback is valuable to us. This questionnaire aims to gather insights into your experiences and perceptions regarding the use of artificial intelligence (AI) in banking services. Please answer each question to the best of your ability. Your responses will remain confidential					
Gender	Male	Female			
Age	Less than 30	30- less than 40	40- less than 50	more than 50	
Qualification	2-year Diploma	BA	Master	PhD	Others
Have you preferred to use online banking services recently?	Yes	No			
X: Artificial intelligence technologies					
Q1: How many times do you interact with the bank's online services per month?	Daily	Weekly	Monthly	Less than once a month	
Y1: customers service	SD	D	N	A	SA
Q3: Have you noticed an improvement in customer service response speed thanks to the use of technology and artificial intelligence?					
Q4: Do you think that artificial intelligence has improved the quality of banking services you receive?					
Q5: Have you interacted with intelligent support systems (such as automated chat or automated responses) during your recent banking experience?					
Q6: Did you find this service more effective and personalized due to AI technology?					
Q7: Did you feel more satisfied as a customer due to applying artificial intelligence techniques in customer service?					
Q8: Do you expect the use of technology and artificial intelligence to continue to improve customer experience in banks in the future?					
Y2: Financing decisions	SD	D	N	A	SA

(continued)

(continued)

Q9: Have you noticed an improvement in the speed of making financing decisions thanks to the use of technology and artificial intelligence?					
Q10: Have you felt an improvement in your customer experience when using AI technologies in finance services?					
Q11: Have you used banking applications or platforms that rely on artificial intelligence technology to obtain financing services?					
Q12: Do you think that the use of intelligent data analysis and machine learning has contributed to improving the accuracy of financing decision-making?					
Q13: Do you think that using AI technology could provide more innovative financing options to customers?					
Y3: Investment decisions	SD	D	N	A	SA
Q14: Have you noticed an improvement in the speed of making investment decisions thanks to the use of artificial intelligence technology?					
Q15: Have you applied for investment data analysis using AI techniques?					
Q16: Do you think that these technologies make the process of analyzing investment data more accurate and effective?					
Q17: Do you think that using artificial intelligence technology may provide more innovative investment options for clients?					
Q18: Have you felt an improvement in your personal experience as an investor thanks to artificial intelligence technologies?					

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The Reality of Customer Satisfaction Regarding the Level of Services Provided by Retail Stores



Jiries Abu Ghannam, Farah Qafisheh, and Mohammad Omar Sabri

Abstract This study aimed to identify the reality of customer satisfaction at the level of services provided, and the study was conducted on Al-Shaab Market Supermarket and Al-Amjad Mall Corporation in Bethlehem Governorate). The descriptive analytical approach to conducting the study and the questionnaire as a main tool for collecting information. The study was conducted on a random sample of (50) questionnaires, which consisted of the sample items, customers of shops in Al-Shaab Supermarket and Al-Majd Supermarket in Bethlehem Governorate. The study reached several results, the most important of which are: The results showed that the degree of service tangibility and customer satisfaction was, as the most common manifestations were the external appearance of the store, followed by the modern and advanced equipment and devices used in the performance of the service. The results showed that the degree of service reliability and customer satisfaction was great, as it was the most common aspect of the shops providing their services correctly, followed by the shops providing the service on time. The results revealed that the degree of response and customer satisfaction was great, as the most common manifestations were the immediate response to the needs of customers, followed by the workers who were always ready to deal with customers, and the least common was immediate response to customers' inquiries and complaints.

Keywords Customer satisfaction · Level of services · Retail stores · Labour market

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1 Introduction

Service quality has become a primary distinguishing factor and the strongest competitive weapon sought by all service-providing organizations to possess. Customers now have more alternatives to choose from according to their preferences. They consider the quality of services in such a competitive market before making their choice. This has compelled organizational managements to understand customers' needs in order to achieve their satisfaction and work towards gaining their loyalty. Customer loyalty is crucial for facing competition due to modern trends that focus on customers rather than the product itself. As competition among service providers increases, every organization must be capable of providing high-quality services to satisfy their customers and ensure their loyalty to continue growing and competing in the market [2].

For growth and development, quality management and achieving customer satisfaction have become priorities for service institutions. Customer satisfaction has become the focus of their attention, constantly researching and understanding customers' needs and expectations, and providing services that meet their satisfaction and loyalty to the institution providing them. Institutions have realized that retaining existing customers is better than seeking new ones, leading their efforts to focus on quality, service performance, and bridging the gap between service performance and customer expectations. However, effectively aligning service performance with customer expectations is challenging and requires serious research into the factors that influence customers' consumption decisions and how customers evaluate the service [4].

The chain of success relies on high customer satisfaction, leading to the continuity of their relationship with the institution, which in turn fosters their loyalty and reduces their likelihood of leaving. This is accompanied by an increase in the institution's returns [1, 6–10].

1.1 Problem Statement and Research Questions

Measuring service quality is one of the key approaches to developing and improving quality in institutions. However, there is variation in how service quality is measured and the variables associated with it. This may be attributed to the novelty of the subject, thus there is an urgent need for this study to deepen the understanding of quality in retail stores in Bethlehem Governorate. Based on this, the problem statement can be formulated in the following main question:

What is the reality of customer satisfaction regarding the level of services provided by the supermarket Souq Al-Shaab and the institution Emjad Mall in Bethlehem Governorate?

From the main question, the following sub-questions branch out:

What is the level of tangibility of service in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate?

What is the level of reliability of service in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate?

What is the level of responsiveness in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate?

What is the level of empathy in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate?

What is the level of assurance in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate?

1.2 Importance of the Study

The importance of this study lies in the following:

Expressing the level of quality of services provided to customers and their compatibility with their desires and needs in order to understand their preferences from the services provided by retail stores, aiming to develop and enhance them to meet customers' desires and needs and gain their satisfaction.

This study is expected to make a modest scientific contribution in the field of improving service quality and the possibility of reaching results regarding improving service quality, through which recommendations can be suggested to increase customer satisfaction.

1.3 Study Objectives

This study aimed to achieve the following main objective:

To determine the reality of customer satisfaction regarding the level of services provided by retail stores operating in Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

From the main objective, the following sub-objectives emerge:

To identify the level of tangibility of service in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

To identify the level of reliability of service in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

To identify the level of responsiveness in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

To identify the level of empathy in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

To identify the level of assurance in relation to customer satisfaction by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate.

1.4 Study Hypotheses

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of customer satisfaction regarding the level of services provided by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate attributed to the gender variable.

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of customer satisfaction regarding the level of services provided by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate attributed to the age variable.

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of customer satisfaction regarding the level of services provided by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate attributed to the educational qualification variable.

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of customer satisfaction regarding the level of services provided by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate attributed to the monthly income variable.

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of customer satisfaction regarding the level of services provided by Souq Al-Shaab supermarket and Emjad Mall institution in Bethlehem Governorate attributed to the place of residence variable.

1.5 Study Limits

- Spatial Limit: This study will be limited to Bethlehem Governorate.
- Human Limit: It will be applied to customers of retail stores in Bethlehem Governorate.
- Temporal Limit: The second semester of the academic year 2021–2022.

2 Methodology

2.1 Study Methodology

The researchers employed a descriptive-analytical approach, which compares, interprets, and evaluates with the aim of reaching meaningful generalizations that enhance knowledge about customer satisfaction levels regarding the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate.

2.2 Study Population

This study focused on the topic of customer satisfaction regarding the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate. Therefore, the study population consisted of customers of Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate.

2.3 Study Sample

The study was conducted on a random sample of 50 questionnaires, representing customers of retail stores in Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate.

2.4 Study Tool

A questionnaire was constructed to obtain the perspectives of the researchers on the study topic.

2.5 Study Tool Reliability

Reliability was calculated using internal consistency method by calculating the Cronbach's Alpha coefficient. The reliability of the study tool was verified by examining the internal consistency of the tool's items using Cronbach's Alpha coefficient on the total study sample, where the reliability value was (0.91), indicating a very high degree of reliability for the tool.

3 Results

Study Question 1: What is the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate?

To answer the above question, the numbers, means, and standard deviations of the customer satisfaction level with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate were extracted on the total scale of the study. The level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate was high, with a mean score of (3.85) on the total scale of the study, with a standard deviation of (0.62).

Study Question 2: What are the most important tangible aspects of service and customer satisfaction?

To answer the above question, the means and standard deviations of the most important tangible aspects of service and customer satisfaction were extracted.

The level of tangibility of service and customer satisfaction was high, with a mean score of (3.91). The most common aspects were the attractive appearance of the commercial premises with a mean of (4.18), followed by modern and sophisticated equipment used in service delivery with a mean of (3.92).

Study Question 3: What are the most important reliability aspects of service and customer satisfaction?

To answer the above question, the means and standard deviations of the most important reliability aspects of service and customer satisfaction were extracted.

The level of service reliability and customer satisfaction was high, with a mean score of (3.81). The most common aspects were businesses providing their services correctly with a mean of (3.86), followed by businesses delivering services on time with a mean of (3.82).

Study Question 4: What are the most important responsiveness aspects of service and customer satisfaction?

To answer the above question, the means and standard deviations of the most important responsiveness aspects of service and customer satisfaction were extracted.

The level of responsiveness and customer satisfaction was high, with a mean score of (3.76). The most common aspects were immediate response to customer needs with a mean of (3.98), followed by employees being always ready to deal with customers with a mean of (3.90), and the least common aspect was immediate response to customer inquiries and complaints with a mean of (3.52).

Study Question 5: What are the most important empathy aspects of service and customer satisfaction?

To answer the above question, the means and standard deviations of the most important empathy aspects of service and customer satisfaction were extracted.

The level of empathy and customer satisfaction was high, with a mean score of (3.76). The most common aspects were service providers demonstrating courtesy in dealing with customers with a mean of (4.14), followed by businesses placing customer interests at the forefront of senior management concerns with a mean

of (3.76), and the least common aspect was service providers offering advice and guidance to customers with a mean of (3.56).

Study Question 6: What are the most important security aspects of service and customer satisfaction?

To answer the above question, the means and standard deviations of the most important security aspects of service and customer satisfaction were extracted. The level of security and customer satisfaction was high, with a mean score of (4.01). The most common aspects were service providers' behavior instilling trust in customers with a mean of (4.10), followed by customers feeling safe when dealing with businesses with a mean of (4.08).

Hypothesis 1: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the gender variable. To verify the validity of the above hypothesis, a t-test was used to compare the differences in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the gender variable.

There were no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the gender variable. There was a clear convergence in the mean scores regardless of gender.

Hypothesis 2: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the age variable.

To verify the validity of the above hypothesis, a one-way analysis of variance (ANOVA) was used to compare the differences in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the age variable. There were no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the age variable. There was a clear convergence in the mean scores regardless of age.

Hypothesis 3: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the educational qualification variable. To verify the validity of the above hypothesis, a one-way analysis of variance (ANOVA) was used to compare the differences in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the educational qualification variable. There were no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the educational qualification variable. There was a clear convergence in the mean scores regardless of educational qualification.

Hypothesis 4: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the monthly income variable.

To verify the validity of the above hypothesis, a one-way analysis of variance (ANOVA) was used to compare the differences in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the monthly income variable. There were no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the monthly income variable. There was a clear convergence in the mean scores regardless of monthly income.

Hypothesis 5: There are no statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the residential area variable.

To verify the validity of the above hypothesis, a one-way analysis of variance (ANOVA) was used to compare the differences in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the residential area variable. There were statistically significant differences at the $\alpha \leq 0.05$ level in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the residential area variable. The differences favored customers from urban areas over those from rural areas, and also between customers from urban areas and those from refugee camps. To identify the source of these differences, Tukey's test was extracted for pairwise comparisons in the level of customer satisfaction with the services provided by Souq Al Shaab supermarket and Amjad Mall in Bethlehem Governorate attributed to the residential area variable.

4 Conclusion

In conclusion, this study focused on examining the reality of customer satisfaction regarding the level of services provided by retail stores, specifically Souq Al-Shaab Supermarket and Emjad Mall in Bethlehem Governorate. The study utilized a descriptive analytical approach and collected data through questionnaires from a random sample of 50 customers. The results of the study revealed several important findings. Firstly, the level of service tangibility and customer satisfaction was high. The external appearance of the stores was identified as the most common manifestation, followed by the modern and advanced equipment used in service delivery. Secondly, the degree of service reliability and customer satisfaction was also found to be high. The correct provision of services by the stores was the most common aspect, and timely service delivery was also highly valued by customers. Thirdly, the degree of responsiveness and customer satisfaction was rated as great. Immediate response

to customer needs and the availability of workers to deal with customers were identified as the most common manifestations. However, immediate response to customer inquiries and complaints was identified as the least common aspect. Based on the research questions, the study also explored the levels of empathy and assurance in relation to customer satisfaction. However, the specific results for these aspects were not provided in the document. The study emphasized the importance of customer satisfaction and its impact on the success and growth of retail stores. It highlighted the need for retail stores to understand and meet customer needs and expectations in order to foster customer loyalty and increase competitiveness. The findings of this study contribute to the understanding of service quality in retail stores in Bethlehem Governorate. The study provides insights into the specific aspects of service that significantly influence customer satisfaction. Overall, this research underscores the importance of continuously improving service quality and bridging the gap between service performance and customer expectations. By focusing on customer satisfaction, retail stores can enhance customer loyalty, increase returns, and thrive in a competitive market. It is important to note that the document provided is truncated, and further details and conclusions may be present in the complete document.

5 Recommendations

Based on the above results, the following are the main recommendations:

- There is a need for retail stores to strive for higher levels of quality by focusing on all dimensions of quality (tangibility, reliability, responsiveness, empathy, security, and customer satisfaction).
- Retailers should not view customers as momentary sources of profitability but rather as future resources and partners in business development.
- It is essential to adopt modern marketing methods and trends in dealing with customers, which necessitate taking customer perspectives into account for service improvement.
- More attention should be paid to human resources in institutions, especially concerning training and development operations within the framework of institutional policies, and efforts should be made to motivate them.

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Real Estate Zakat and Its Jurisprudential Rulings



Fatima Al-Aroj, Suhail Al-Ahmad, and Anas Mohammad Awad Alkalaileh

Abstract This research sheds light on Zakat (obligatory charity) on real estate and its jurisprudential rulings in Islam. I clarified the meaning, both linguistically and technically, of Zakat and real estate. I explained the ruling of Zakat on commercial re-al estate and agricultural land, as well as the significance and legitimacy of Zakat in Islam. The main objectives include highlighting Zakat on commercial real estate and ex-plaining its jurisprudential rulings. The research employed both descriptive and analytical methodologies to elucidate Zakat on real estate and its jurisprudential rulings. One of the key findings is that real estate refers to immovable as-sets such as land and buildings, which may be intended for agriculture or commercial purposes. Zakat is obligatory on commercial real estate and is calculated at 2.5% of its value after reaching the Nisab (minimum threshold) and one lunar year has passed. Zakat is due on the value of these proper-ties, not on the properties themselves, as the Nisab is determined based on their value.

Keywords Zakat, · Zakat on real estate · Commercial real estate · Agricultural land · Local economic development

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1 Introduction

"Praise be to Allah, the Lord of all worlds, who has taught us, guided us, and directed us to the right path. We are grateful for the blessing of intellect, which distinguishes us from all other creations. Peace and blessings be upon the Prophet, who was sent as a mercy to the worlds, his family, companions, and those who follow them in goodness until the Day of Judgment.

Fulfilling the understanding of religion, particularly in con-temporary matters, is crucial. Therefore, my research focuses on a contemporary Islamic jurisprudence topic: Zakat on real estate. Zakat is one of the pillars of Islam, mandated by Allah to purify the wealth of the giver and elevate their morals through charity, generosity, and abandoning greed and miserliness. This is encapsulated in the verse: 'Take, [O, Muhammad], from their wealth a charity by which you purify them and cause them increase, and invoke [Allah's blessings] upon them. Indeed, your invocations are reassurance for them. And Allah is Hearing and Knowing.' (At-Tawbah, 103).

Zakat, beyond its religious significance, is a cornerstone of Islamic economics. It mobilizes stagnant wealth and channels it towards development and investment. Many Muslims today overlook the obligation of Zakat on real estate, especially commercial properties, which generate income either through capital gains or rental yields. In this research, I will elucidate the linguistic and technical understanding of Zakat, clarify the calculation of Zakat on commercial real estate, address whether Zakat is applicable to agricultural land, and discuss its ruling and legitimacy in Islam."

2 The First Topic: Zakat and Real Estate Linguistically and Legally

First Requirement: The Concept of Zakat Linguistically and Legally.

"In language, Zakat means growth and increase, as these meanings are reflected in the verse: 'Take, [O, Muhammad], from their wealth a charity by which you purify them and cause them increase, and invoke [Allah's blessings] up-on them. Indeed, your invocations are reassurance for them. And Allah is Hearing and Knowing.' (At-Tawbah, 103). It purifies the giver from sin and Zakat also carries the meaning of praise and righteousness [1].

In legal terminology, jurists have defined Zakat in various ways, though all these definitions converge on a single meaning. Hanafi jurists defined it as: 'The action of fulfilling an obligatory right upon wealth, contingent upon the passage of a year and reaching the minimum threshold' [2]. Maliki jurists defined it as: 'A specific portion of wealth taken from specific wealth, upon reaching a specific amount within a specific time, to be spent on specific categories' [3], Shafi'i jurists defined it as: 'A specific amount taken from specific wealth, obliged to be spent on specific categories

with specific conditions' [4], Hanbali jurists defined it as: 'An obligatory right upon specific wealth' [5].

In contemporary jurisprudence, it is defined as: 'The predetermined portion of wealth that Allah has mandated for the deserving recipients' [6].

The Second Point: The Concept of Real Estate

> … Real estate, linguistically, is the plural of 'aqar, referring to land, cultivated fields, and palm trees, as well as movable property, as in the saying 'what has no home or real estate.' Some say it refers to any fixed ownership, such as houses and palm trees.

In legal terminology, real estate encompasses anything with a fixed foundation and stability, such as land and houses, or anything owned by individuals, including buildings, palaces, apartments, shops, gas stations, rest houses, and the like. It refers to anything fixed and immovable, such as land and buildings.

Zakat on real estate, in Sharia terminology, is the financial obligation imposed on what individuals own of lands, buildings, and the like, which are fixed as-sets yielding profits and income to their owners…".

The second point: The Status of Zakat in Islam and the Ruling Established in its Legitimacy:

First Point: The Status of Zakat in Islam

> … Zakat is an obligatory duty, and its status is among the greatest matters in Islam for the following reasons: [7].

Zakat is the third pillar of Islam, forming one of the foundations of Islam. This is evidenced by the Hadith of Abdullah ibn Umar, may Allah be pleased with them both, who reported that the Prophet Muhammad (peace be upon him) said: "Islam is built on five pillars: testifying that there is no god but Allah and that Muhammad is the Messenger of Allah, establishing prayer, paying zakat, fasting the month of Ramadan, and performing Hajj to the House (the Kaaba)." (Sahih Muslim) Another narration states: "Islam is built upon five pillars: to worship Allah and disbelieve in what is worshipped besides Him, to establish prayer, to give zakat, to perform Hajj, and to fast Ramadan." (Sahih Muslim).

3 The Second Topic: The Status of Zakat in Islam and the Established Rulings Regarding Its Legitimacy

First Aspect: The Status of Zakat in Islam

1. Zakat is a pillar of Islam, mentioned alongside prayer in numerous places in the Quran, indicating its significance to Allah. This underscores its elevated status and importance, as stated in the verse: "Establish prayer and give zakat and bow with those who bow [in worship and obedience]." (Al-Baqarah, 43)

2. The Prophet Muhammad (peace be upon him) meticulously attended to the matter of Zakat, demonstrating its profound importance in Islam. Authentic Hadiths extensively discuss the obligation, payment, and significance of Zakat, as well as the consequences for neglecting it, including the obligation to fight those who refuse to pay it. The types of wealth subject to Zakat, such as livestock, gold, silver, trade goods, and agricultural produce, are elaborated upon. Additionally, the Sunnah provides detailed rulings on Zakat, clarifying the categories of people eligible to receive it. Imam Ibn Athir recorded over a hundred Hadiths on Zakat, indicating its paramount importance [8–15].
3. Severe warnings and admonitions are issued against those who withhold or neglect Zakat, as evidenced by Quranic verses such as: "And let not those who [greedily] withhold what Allah has given them of His bounty ever think that it is better for them. Rather, it is worse for them. Their necks will be encircled by what they withheld on the Day of Resurrection." (Al Eimran: 180).

Second Aspect: The Established Rulings Regarding the Legitimacy of Zakat

1. Fulfilling Zakat is essential for the completeness of an individual's Islam, as it constitutes one of the fundamental pillars of the faith. By fulfilling Zakat, a person achieves the pinnacle of their faith and completes their submission to Allah.
2. Zakat purifies the believer's soul from the stains of sins and transgressions, cleansing it from the vices of stinginess and greed, which have detrimental effects on the heart. Allah says: "Take, [O, Muhammad], from their wealth a charity by which you purify them and cause them increase." (altawbati: 103). Zakat ensures the sufficiency of needy Muslims, addressing their needs and honoring them, thereby sparing them the humiliation of begging from others.
3. Zakat fosters social solidarity and cohesion within society.
4. Zakat increases blessings in the wealth of the giver and protects them from afflictions, as stated in the verse: "And whatever you spend of expenditures or make of vows—indeed, Allah knows of it. And for the wrongdoers there are no helpers." (Albaqara, 270).
5. Zakat extinguishes the wrath of the Lord, as mentioned in the Hadith narrated by Anas (may Allah be pleased with him): "Charity extinguishes the wrath of the Lord."
6. Zakat encourages generosity and giving among Muslims, leading to an open-heartedness that has been empirically observed by behavioral psychologists.
7. Zakat is one of the greatest means by which Allah bestows His mercy upon His servants in this world and the Hereafter. Allah says: "And establish prayer and give zakat and obey the Messenger—that you may receive mercy." (alquran, 56).

Third Topic: Rulings of Zakat on Property, with Three Aspects:

First Aspect: Zakat on Commercial Property

There is disagreement among scholars regarding the obligation of Zakat on property designated for trade, with two opinions:

The first opinion: Scholars, including the four Imams and their followers, assert the obligation of Zakat and provide evidence as follows:

1. Quranic verse: "Take, [O, Muhammad], from their wealth a charity by which you purify them and cause them increase." (altawbati: 103). The phrase "Take from their wealth" indicates specificity, implying taking a portion of their wealth, not all of it. This Zakat purifies them from sins and the negative effects of materialism.
2. Hadith of Samurah: The Prophet Muhammad (peace be upon him) instructed to pay Zakat from what is prepared for sale.
3. Prophetic statement: "There is no right in wealth other than Zakat." This indicates the generality of Zakat, encompassing all types of wealth.

The second opinion: Scholars like Dawud al-Zahiri (Al-Andalusi, No date specified) argue against the obligation of Zakat on commercial property, citing different evidence:

1. Hadith: "Seek from the wealth of the orphans [for Zakat] so as not to eat it up." This indicates exemption from Zakat for property intended for trade.
2. Hadith of Abu Huraira: "There is no Zakat on a Muslim for his slave or horse." This generalizes the exemption from Zakat for certain possessions.

Second Aspect: Zakat on Residential Property

Residential property, such as a house or vehicle used for personal purposes, is exempt from Zakat according to the consensus of scholars. This is supported by the Hadith of Abu Huraira: "There is no Zakat on a Muslim for his slave or horse." This exemption applies as long as the property is not used for commercial purposes.

Third Aspect: Zakat Calculation for Commercial Property

Regarding the calculation of Zakat for commercial property, scholars agree that it is one-quarter of the total value, similar to cash. Imam al-Nawawi stated that Zakat for commercial property, whether for trade or rent, is one-quarter of the total value, added to other Zakatable assets. If the value reaches the mini-mum threshold (nisab), Zakat becomes due at a rate of 2.5%.

Example of Zakat Calculation During Property Downturn

If someone owns land during prosperous times but faces difficulty in finding buyers during a downturn, there is no Zakat obligation until they sell the property. Once sold, Zakat is paid for one year only.

Fourth Aspect: Consideration for Valuation in Zakat Assessment

Scholars differ on when to assess the value of property for Zakat calculation:

1. Majority opinion: Valuation should occur at the due date of Zakat.
2. Ibn Abbas's opinion: Valuation should wait until the property is sold to determine its value for Zakat calculation.
3. Some early scholars: Valuation should be based on the purchase price.

4 Conclusion

Praise be to Allah, the Lord of all worlds, who has aided me in completing this work. All praise and thanks are due to Him, for He is the best with which one concludes their deeds. Now, it is fitting for me at this juncture to present the key points covered in this study:

1. Real estate refers to fixed assets that cannot be moved or transferred from one place to another, such as lands, buildings, and the like. They are either prepared for residential purposes or for commercial use.
2. There is no Zakat on real estate intended for primary needs, as they are occupied with essential personal needs and do not generate income. These are what jurists refer to as "personal real estate in al-Qinya." However, this ruling is not absolute but rather conditional on not evading or circumventing Zakat. Personal properties in al-Qinya are exempted. However, if they are used for commercial purposes—according to the intention of the owner and their engagement in commercial transactions—then Zakat is obligatory.
3. Zakat is obligatory on commercial real estate—this is the opinion of the four jurists and the majority of scholars. Zakat is calculated at 2.5% after reaching the threshold and the passage of one year. It is calculated based on the market value of the real estate, not on the property itself, as the threshold is considered in terms of value.

5 Recommendations

Here are the most important recommendations of this study:

1. I recommend Sharia institutions and scholars to prioritize Zakat and clarify its rulings, in order to fulfill the right of Allah Almighty and meet the needs of the deserving recipients.
2. I advise property owners to seek assistance from specialists when evaluating their properties and fulfilling the duty mandated by the noble Sha-ria to pay Zakat.

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The Impact of Unforeseen Circumstances on the Murabaha Contract for the Purchaser



Ward Barmil, Suhail Al-Ahmad, and Tareq Hammad Almubaydeen

Abstract The theory of unforeseen circumstances has an impact on Islamic finance contracts. The theory of unforeseen circumstances is excluded from the theory of contract binding. This research is a practical application of the theory of unforeseen circumstances in a profitable sale. The purchase order came at a time when emergency circumstances and unexpected incidents affecting the implementation of the contract abounded.

Keywords Emergency circumstances · Contract necessity · Murabaha · Regional economic growth

1 Introduction

Praise be to Allah, the Lord of the Worlds, and blessings and peace be upon the Messenger, a mercy to the worlds, and upon his family and companions, and those who follow them with excellence until the Day of Judgment. In my research, I have addressed the topic of Murabaha contract for the purchaser, its nature, the conditions related to it, with the help and guidance of Allah. Significance of the Research: The Murabaha contract for the purchaser is one of the contracts that have become prevalent in our present time. Due to the unforeseen circumstances that may arise in such contracts beyond the control of the contracting parties, I will explore the application of the theory of unforeseen circumstances in the Murabaha contract for the purchaser, even if some scholars permit it under certain conditions, as the

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majority opinion suggests. Research Objectives: This research aims to establish the theory of unforeseen circumstances in the Murabaha contract for the purchaser, taking into account the conditions of people in difficult circumstances that may arise. Research Problem: This study aims to answer the main question: What is the impact of unforeseen circumstances on the Murabaha contract? What is its ruling according to jurists? What are the evidences supporting their opinions? The Impact of Unforeseen Circumstances on the Murabaha Contract for the Purchaser.

First Requirement: Definition of the Theory of Force Majeure.

The theory of force majeure is a composite concept consisting of three terms, each of which must be broken down and defined individually for a proper understanding.

Theory: A general concept that forms an objective legal system encompassing various elements distributed across different sections, such as the theory of rights and the theory of guarantee.

Circumstances: The condition of times and places.

Emergency: Derived from the verb "to emerge," meaning to appear unexpectedly.

The theory of force majeure can thus be described as: extraordinary events that occur suddenly without anticipation, constituting an unusual state not foreseen by the contracting parties at the time of contracting. These events result in the performance of the contractual obligation becoming burdensome for the debtor, threatening them with significant loss [1–8].

The application of the theory of force majeure can be defined as: the modification of a burdensome obligation from an unperformed contract or its termination due to an unexpected event beyond the control of the contracting parties.

Second Requirement: Establishing the Theory of Force Majeure.

Allah's Statement in the Quran: "Allah does not burden a soul beyond that it can bear" (Al-Baqarah 2:286). This verse indicates that Allah, the Almighty, does not impose on anyone that they cannot bear. It is understood that a debtor's burdensome obligation under a contract in the event of force majeure falls into what they cannot bear, necessitating the modification or termination of the contract. The first topic:

The second topic: Verse 29 of Surah An-Nisa states: "O you who have believed, do not consume one another's wealth unjustly or send it [in bribery] to the rulers in order that [they might aid] you [to] consume a portion of the wealth of the people in sin, while you know [it is unlawful]."

Interpretation: The indication here is that maintaining a contract affected by a force majeure event without terminating or adjusting it to achieve the interests of both contracting parties—balancing what each party has given and received—would be considered unjust consumption of people's wealth and would be unfair to the other party.

Verse 280 of Surah Al-Baqarah: "And if someone is in hardship, then [let there be] postponement until [a time of] ease. But if you give [from your right as] charity, then it is better for you, if you only knew."

Interpretation: This verse signifies the obligation to defer a debt for someone in difficulty until their situation improves, which indicates the legitimacy of the theory of force majeure.

Prophetic Saying: "There should be neither harming nor reciprocating harm."

Interpretation: If harm occurs to anyone, it must be removed. In the context of the theory of force majeure, a contract becomes burdensome and harmful, leading to significant loss due to circumstances beyond one's control.

Principle: Ordinary or existing hardship does not nullify obligations or necessitate leniency, such as the hardship of hunger and thirst during fasting. However, if the hardship exceeds natural limits, it nullifies or mitigates the obligation, like the hardship of a sick person fasting. Similarly, in commerce, usual losses do not affect contracts, but if losses exceed the norm due to uncontrollable circumstances, an exceptional measure becomes necessary.

Third Requirement: Conditions for Applying the Theory of Force Majeure.

The extraordinary circumstance must occur before the completion of the contract's execution. If it occurs after the contract has been fully executed, the theory cannot be applied.

The extraordinary circumstance must be exceptional and unforeseen, meaning it is rare and unlikely to occur, such as wars, earthquakes, floods, or health pandemics.

The contract should not be a compulsory contract. In the case of compulsory contracts where the parties do not have the freedom of choice, such as mandatory car accident insurance, the theory does not apply because both parties are compelled into the contract.

The extraordinary circumstance must be general, like wars. Individual-specific circumstances, such as the theft or burning of one's money, or a strike by their workers, are not considered for the application of the theory's provisions. This is to prevent misuse, such as the debtor destroying the item and claiming it was an unintentional event.

The second opinion: It is not required that the extraordinary circumstance be general, which is in line with the Hanafi school of thought, for the following reasons:

The goal of applying the theory of extraordinary circumstances is to avoid the burden and substantial loss that may befall the debtor. The circumstance could be general or specific.

The theory is an exception to the principle of the contract's binding nature; therefore, the scope of this exception should be confined to the contractual relationship between the parties, making its application individual.

The concept of burden varies from person to person, and thus, each debtor should be considered individually. The focus should be on the person who is burdened by the obligation due to an extraordinary circumstance without restricting it to general circumstances.

Preferred Opinion: The prevailing view is to apply the provisions of the theory even if the extraordinary circumstance is specific for the following reasons:

The evidence supporting the legitimacy of the theory of extraordinary circumstances is general and includes both general and specific extraordinary circumstances.

First Requirement: Definition of Murabaha to the Purchase Orderer

Murabaha:

Linguistically: It refers to growth in trade.

In the terminology of jurists: It is the sale with a markup over the original price.

Murabaha to the purchase orderer: "A person requests another to buy something specified by him, to take it from him at a deferred price with a known markup." It involves an individual requesting another person to purchase a specific commodity with defined specifications, based on a promise from the requester to buy that required commodity through Murabaha.

Most contemporary jurists have ruled that this type of sale is permissible under certain conditions.

Second Requirement: Effects of Extraordinary Circumstances on Murabaha to the Purchase Orderer

First: If an extraordinary circumstance occurs after the buyer requests the commodity from the seller and before the contract is concluded, is the buyer obligated to fulfill the contract or not? This issue is based on the matter of promises, and there is a disagreement among scholars with three different opinions:

First Opinion: The Malikis hold that the commitment to a promise is obligatory if it is conditional upon a reason; they base this on the following:

This prevents actual harm to the seller caused by the buyer's deceit.

Second Opinion: The Shafi'is, Hanbalis, and Hanafis hold that the buyer is not obligated to the contract, but it is recommended to fulfill it; they base this on the following reasons:

If a person promises money and then goes bankrupt, the promisee does not have a debt claim against the promisor. This indicates that the promise is not obligatory; if it were, the promisee would have received some of the money.

A promise is a gratuitous contract and does not necessitate commitment, similar to a gift.

Third Opinion: Some Hanafis hold that the commitment to a promise is obligatory if it is conditional because a conditional promise demonstrates a sense of obligation.

Preferred Opinion: The researcher favors the position taken by the Islamic Fiqh Council, which states: "A promise issued by either the orderer or the executor independently is morally binding on the promisor unless there is an excuse. It is legally binding if it is conditional upon a reason and the promisee has incurred expenses as a result of the promise. In such a case, the obligation's effect is either to fulfill the promise or to compensate for the incurred harm."

If the buyer is unable to pay the installments due to insolvency: If the buyer is unable to pay the installments because of an extraordinary circumstance leading to insolvency, it is obligatory in Islamic law to grant a deferment until the buyer is in a better financial position. This is the view of the four Imams and the Zahiris for the following reason:

Allah's statement: "And if someone is in hardship, then [let there be] postponement until [a time of] ease" (Al-Baqarah: 280) [9].

Narrated by Abu Sa'id al-Khudri (may Allah be pleased with him): A man was afflicted in the time of the Messenger of Allah (peace be upon him) regarding fruits he had bought, and his debt became excessive. The Messenger of Allah (peace be upon him) said: "Give charity to him." So the people gave charity to him, but it was not enough to pay off his debt. The Messenger of Allah (peace be upon him) then said to his creditors: "Take what you find, and you have nothing more than that." This means that since he is insolvent, you only have the right to take what you have received and are not allowed to demand more as long as he is in difficulty. This indicates the obligation to grant him deferment until he is in a better position.

Second: If the buyer is unable to pay the installments due to bankruptcy while the sold item remains in his possession, the situation can be divided into two sub-branches:

First Branch: If the buyer goes bankrupt after the installments are due, and the seller finds the sold item intact and has not received any part of the sale price. Jurists have two opinions on this matter:

First Opinion: The seller has the right to annul the contract. This is the view of the majority of jurists and the Zahiris, for the following reasons:

Narrated by Abu Hurairah that the Messenger of Allah said: "If anyone finds his property intact with a man who has become bankrupt, he has more right to it than anyone else." This indicates that if a person finds what he sold with someone who has gone bankrupt, he has more right to that sold item than other creditors, allowing him to annul the sale and take back the item.

They also argue by analogy: if the seller fails to deliver the sold item, the buyer is allowed to annul the contract. Similarly, if the seller finds the sold item with the buyer who is unable to pay the price, the contract can be annulled [10].

Second Opinion: The seller does not have the right to annul the contract and must be treated equally with other creditors. This is the Hanafi view, based on the following reasoning:

Allah's statement: "And if someone is in hardship, then [let there be] postponement until [a time of] ease" (Al-Baqarah: 280). They argue that the seller cannot demand the price as the debtor must be granted deferment due to their difficulty, making the debt postponed by Shariah's decree, and a postponed debt is not immediately due [11].

The majority respond that the verse is general and has been specified by the mentioned hadith.

Preferred Opinion: The researcher favors the first opinion, which allows the seller to annul the contract if he finds the sold item intact and no one else has rights over it. The hadith used as evidence is authentic and directly addresses the disputed issue, thus it should be followed.

Second Branch: If the buyer goes bankrupt, and the seller finds the sold item intact, but has received part of the price. Jurists differ on this issue with three opinions:

First Opinion: The Malikis and Zahiris hold that the seller has the option either to annul the contract, reclaim the sold item, and return the received payment, or to not annul and join the creditors in claiming their dues. This is based on the generality of the Prophet's (peace be upon him) saying: "If anyone finds his property intact with a man who has become bankrupt, he has more right to it than anyone else." The hadith does not differentiate, indicating that the seller can annul the sale even if he has received part of the payment [12].

Second Opinion: The Hanbalis argue that the seller cannot annul the contract but must be treated equally with other creditors. This is based on the hadith of Abu Huraira where the Prophet (peace be upon him) said: "If any man sells a commodity and then finds it intact with the buyer who has become bankrupt and has not received any of its price, he has more right to it [13]. If he has received part of the price, he shares with the other creditors." This indicates that if the seller has received any part of the payment, he is treated equally with the other creditors and cannot annul the sale [14].

Third Opinion: The Shafi'is believe that the seller can claim the part of the sold item proportionate to the remaining unpaid price. They argue that if the seller can reclaim the entire item when no payment has been received, he should similarly be able to reclaim part of it based on the unpaid portion.

Preferred Opinion: The researcher leans towards the first opinion, which gives the seller the choice. This is due to the general applicability of the hadith cited as evidence. It is an authentic hadith and stronger than the mursal hadith cited by the Hanbalis [15].

Third Requirement: **If the Buyer Goes Bankrupt and the Installments Are Deferred and the Seller Finds the Sold Item Intact.**

Jurists have two opinions on this matter:

First Opinion: The Malikis hold that the seller has the right to annul the contract immediately, making the deferred installments due. This is because the seller agreed to defer payment based on the buyer's ability to pay, and if the buyer loses this ability, the seller is no longer obliged to defer payment.

Second Opinion: The Shafi'is argue that the seller cannot annul the contract in this situation for the following reasons:

Deferred payments are not immediately claimable as they are not yet due.

Immediate debts take precedence over deferred debts; thus, they must be considered first [16].

The deferment period is a right for the buyer, which should not be forfeited.

Preferred Opinion: The researcher favors the second opinion, as deferred installments should not become immediately due upon the buyer's insolvency, respecting the buyer's right to deferment.

2 Conclusion

At this juncture, it is pertinent for me to outline the key points covered in this study:

Force majeure theory can be defined as: modifying or terminating an onerous obligation from an unexecuted contract due to an unexpected event beyond the control of the contracting parties.

There are conditions that must be met for the application of the force majeure theory.

It is not necessary for the force majeure circumstance to be general; it can be applied even if it is specific.

If the buyer is unable to pay installments due to a force majeure circumstance, then it is a religious duty to wait for him until he is financially capable.

If the buyer goes bankrupt due to a force majeure circumstance, and the installments are due while the item remains with the seller, then the seller has the option to rescind the contract and reclaim the item, or to uphold the contract and join the creditors, whether or not he has received part of the price.

In Murabaha sale to the purchasing agent: If a force majeure event occurs after the buyer has requested the goods from the seller and before the contract is concluded, the buyer is not obligated to purchase. However, if the seller incurs a loss due to the promise, then the buyer is only obliged to compensate for the damage.

The force majeure theory is applied in Islamic law even if the term is not explicitly mentioned, and there are many diverse evidences for its application, which confirms that Islamic religion is a religion of justice.

3 Recommendations

To explore the theory of force majeure in Islamic jurisprudence through an academic thesis that integrates theory and application across all branches of jurisprudence. Islamic financial institutions are obligated to adhere to the decisions issued by the juristic councils, provided there is consensus among them.

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The Role of Language in Constructing and Reinforcing Political Identities



Aref A. Murshed and Alalddin Al-Tarawneh

Abstract This article explores the intertwined, complex and changing dynamics behind the role of language in the construction and reinforcement of political identities, informed by linguistic and sociological theory which together form the basis for analyzing recurring issues. Language plays a complex role in identity construction. Employing a mixed methods approach, historical and contemporary case studies are examined to reveal how the use of language helps to define political groups and shape political discourse. Case studies of Italian unification, the Scottish independence movement, and the Rwandan genocide, among others, span centuries and provide a historical and contemporary framework for illustrating how language continues to have a crucial impact on the dynamics of political identity today. The article also discusses ethical considerations, focusing on the manipulative potential of language and how it can be misused to the detriment of political dialogue, illustrating how the changing character of our times plays a role in redefining the intertwined connections between languages. Crucial role, and political stance. The paper demonstrates that identity formation in our time now remains a matter of choice and boundary change, and that we, as academics and ordinary citizens, need to constantly monitor how our understanding of it evolves in order to prevent misuse and promote success in a challenging modern era. Constructive dialogue based on mutual understanding in the political world. These meaningful results contribute to a nuanced understanding of how language is both a mirror and a form of political alliances—a conceptual dimension that has proven crucial in shaping political identities.

Keywords Language · Political identities · Identity construction · Linguistic manipulation · Case studies · Sociological theories · Ethical considerations

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1 Introduction

Language is an important tool for expressing our humanity. It shapes every level at which society constructs and continues to sustain a complex and diverse political landscape. The interplay of language and politics is an ever-changing nexus of ideas, beliefs, self-image, and community identity. This article explores the paradoxical relationship between language and political identity to shed light on the relationship between language production and the formation and maintenance of collective identities.

The political power of language goes far beyond its function of communication/expression: it shapes political identity. The view that language has little political power as a mere means of communication—often viewed as primitive—seems historically wrong and may well be analytically wrong. The idea that "language matters" has profound political implications for our society, from promoting unity and stability to protecting ethnocultural diversity. History and other civilizational experiences show that the linguistic factor plays an important role in defining and distinguishing political entities: it helps to create a sense of political community among people who share a common language/speech.

The way language is used to construct, express, influence and displace political alliances, agendas and identities has changed dramatically since the beginning of human history. How we experience and imagine our political life and environment depends on the society we live in and the way it develops over time, according to the movement of historical events and the ever-changing socio-cultural patterns that exist in every society and era. The speeches of ancient speakers convinced as many audiences as the dissemination of political discourse on digital platforms today; language remains the primary tool through which politics is constructed and represented as uniquely human and individualistic action [7].

Fundamentally, however, this appears to be a complex and mutually reinforcing relationship between language and political identity. Language not only enables speakers to communicate ideas, but perhaps more importantly, it is an important means of creating, defining and strengthening political connections: if we look at some historical examples, it becomes clear how the expressive forms of language contribute of. Divide powerful political entities. Whether guided by territorial names (such as the Levant or Mesopotamia) or linguistic names (such as Ionia, Helena, and Thracian), the identities of civilizations such as Greece, Rome, and Persia were sometimes expressed in words and deeds underpin political interests and reflect language groups—the quasi-group of the two. Today, we use words and phrases to talk about political issues that, when combined, help articulate a nation's political identity.

However, this interaction does not only occur in the official political arena but also permeates everyday conversations. The way we speak, our linguistic diversity and small lexical variations are crucial in defining who we are and in promoting the idea of identity formation within shared political commitments [5]. In this way, language can inscribe concepts of homogeneity for a single country or heterogeneity for more

complex domains. What I am trying to illustrate here is how languages help create political identities, how they shape and shape them, and how their boundaries and contours can be constructed and reconstructed over time.

Understanding the place of language in politics is more than a cursory academic task—it has profound implications for ideas and experiences of social solidarity, the workings of politics, and the survival of different cultures. Language itself can be persuasive, but political leaders also use language as a medium to elaborate narratives, solidify political sentiment, and create a sense of identity and belonging (speech and rhetoric are manufactured, after all).

Furthermore, recognizing the role of language in politics is crucial to overcoming difficulties that arise from linguistic diversity within and between political units. Political arrangements that recognize and accommodate multiple languages contribute to a more inclusive political system [14]. Conversely, neglect or instrumental use of language can reinforce social stratification, exacerbate conflicts, and undermine the formation of common political forums [11].

Understanding the complex interplay between language and political identity can help improve the quality of these spaces, support the political inclusion of minority language speakers, and generally protect linguistic diversity—in an increasingly interconnected and interdependent planet, this is not an easy task.

1.1 Objective

The study of the role that language plays in the construction and maintenance of political identities, as our paper is titled, is an important source of understanding the processes by which groups define themselves in a world of political participation. By looking to the past, drawing lessons from the present, and describing contemporary language politics and the impact of technology on political discourse, we aim to gain insights into the intersectional role of this relationship and its significant implications for democracy and the capacity of government to accommodate different political identities. We believe that we contribute to a nuanced understanding of how language can serve as a tool of mirror representation and persuasion in the creation and maintenance of political identities.

1.2 Methodology

They are carefully crafted to reveal the subtle connections between language and emerging patterns of political identity. Descriptive analytical methods enable researchers to jointly examine past and present case studies and carefully document and interpret language use, discourse structure, and rhetorical strategies in political communication. Qualitative methods such as critical discourse analysis, historical

inquiry and interpretation. Examining the meaning and life of our political identities does not have to be reductionist. Rather, this approach allows us to trace how language shapes political identities and transforms them into electoral resources and mobilizing structures. Since agency is distributed throughout society, the study of political language is important because it illuminates the importance of the smallest details. There are words and phrases that are particularly important in making up "us", such as "us", "the people", "our" and "yours", but there are other hidden puzzle pieces that are equally important in building up "us". Political speech contributes to a better understanding of these mechanisms and, ultimately, a better understanding of the relationship between language and politics.

2 Literature Review

Scholars have also examined aspects of language and political identity formation, showing that language both reflects and actively contributes to the creation of a sense of belonging. Scholars such as Anderson [5] explain the creation of imagined communities as a prerequisite for nationhood, noting that much of this is based on language as the basis for a shared cultural identity. Researchers such as Chilton [8] have emphasized the role of language intermediaries in organizing public space, describing political history, and conveying citizens' sense of being part of the nation. Scholars such as Smith [15] have examined the history of language-based boundaries between political groups and shown that language differences are powerful markers of identity. Researchers have also developed theoretical frameworks such as: Van Dijk [19] as a guiding approach to language relations and social identity theory, illustrating how language reflects and actively shapes political identity through language-specific scripts and cognitive processes.

In addition, the critical discourse analysis framework proposed by Fairclough [10] helps scholars unearth the power movements behind political rhetoric and communication by analyzing the linguistic details of it. Not bored yet? Phillipson's [14] work on language policy contributes to the discussion of how state-related decisions contribute to or shape the choice and negotiation of political identities, particularly in multilingual societies. Fishman's [11] work on language in sociocultural change examines the interrelationship between language use and political development—sometimes language change leads to political change, because language change sometimes reflects and sometimes drives political change.

Even in our own time, the digital world brings new perspectives to the study of language and political identity. For example, in the context of the digital age, Crystal [9] and Castells [6] discuss language use on the Internet, how it fosters political communities, mobilizes movements, and even fragments and dissolves political discourse. Digital spaces, perhaps most notably social media, host political identities based on the construction and contestation of linguistic meanings. Tufekci [18] and Sunstein [16] analyze echo chambers and filter bubbles in online verbal interactions in the political sphere.

What is clear from this literature review is the importance and dynamism of language as both a vehicle and a conduit for the development of political identity: Language is a complex and constantly evolving area of research in the social sciences [2]. A variety of historical backgrounds, theoretical frameworks, and contemporary studies have been conducted to understand the role of language in the complex process of identity formation [1].

3 Theoretical Framework

The claim that identity is rooted in language draws on implications from linguistic and sociological theory on the relationship between verbal expressions and individual and group identities. In particular, Whorf's theory of linguistic relativity provides a formal framework for understanding the interplay between language structure, categorical ways of thinking, and the formation of cultural and social identities, proposing that the language a person uses determines the way a person thinks, and More than just shaping the way a person thinks., but there are limitations. Thus, Wolff argued that language structures influence the way we perceive and classify the world around us, thereby influencing the categorization processes that lead to the formation of our cultural and social identities. Wolf [20] proposed that language is not only the reproduction of sound, but also the control mechanism of reality.

Social identity theory, proposed by Henry Tajfel and John Turner, shows us that people tend to sort themselves and others into different groups based on common characteristics. Language is a core criterion that divides individuals into specific groups; it constructs social identities and influences how individuals see themselves in relation to others. Language serves as a symbolic tool that helps form and maintain social identity. According to symbolic interactionism from the work of social psychologist George Herbert Mead, identities are not innate; it arises from interaction with society. Society is like a mirror that allows individuals to see themselves through others and reflect on their own experiences and encounters. Mead [13] believed that language has a symbolic coordinating function, allowing people to fulfill their social roles while developing self-awareness [3]. From Goffman's dramaturgical perspective [12], social existence is a spectacle in which people reveal themselves to others through strategic actions. A Scot living in Islamic Malaysia would know that English is a valid language in which to conduct business. According to a symbolic interactionist perspective, language functions as an active object through which individuals exercise and negotiate their identities and shape themselves in various social contexts.

By combining them, we can gain insight into how our identities are constructed through language. More specifically, an examination of the relationship between language and thought (Whorfian linguistic relativity) makes it easier to understand how this happens. Using social identity theory, we can recognize the role that language plays in constructing social groups and injecting certain words and phrases into our self-identity.

Finally, drawing on symbolic interactionism and Goffman's theatrical approach, we return to the world of sociology, whose perspective focuses on the details of linguistic interaction through which social actors shape and enact themselves within the ever-changing discourse of interpersonal communication identity of.

By raising awareness of the interplay between linguistic processes (including language use, grammatical choices, strategies and meaning connotations, and more importantly how people feel language affects them) and sociological processes (e.g. ideology, linguistics hierarchy and economic aspects). (For example, differences can influence the dynamics between individual and collective identities due to the language they use.) This holistic model provides a solid foundation for addressing the complex ways in which language is used to construct and construct individual and collective identities.

4 Language and Political Identity Formation

This is because we form our political identities primarily through language; as groups develop and maintain their political identities, their languages take on meaning as political markers. "The prerequisite for the political to be possible is a form of self-definition that is entirely dependent on language," because "the boundaries that shape 'in-group' and 'out-group' are always expressed in linguistic terms," Derrida writes. This chapter explores how our language allows us to create political entities. By exploring the linguistic mechanisms that play an important role in the complex process of identity formation, we can gain new perspectives on the conditions that enable us to form meaning.

Language is a marker of political outgroups. It shapes the ways in which political identity becomes boundary work. The ultimate aim is to understand how discourses, words, and symbols produce political identities through analysis that reveals the cognitive role of classification and the social role of distinction in political rhetoric. I also consider Whorf's theory of linguistic relativity [20] to guide my analysis of how language classifies political identities through cognitive methods of socially defining language work. Likewise, I argue that social identity theory [17] is a way of looking at work in the sociology of language through processes of social categorization that continually construct and reconstruct social identities.

Specific linguistic features of language—the types of words we choose, certain accents we have, even the language we speak—can serve as meaningful symbols that represent and reinforce our political identities. Our purpose in this section is to highlight a variety of concrete examples: slogans, phrases, catchphrases, and linguistic enclaves that are used deliberately and strategically to signal an endorsement of a particular political entity of loyalty [4]. The results extend beyond the time frame of ancient and modern Athens. The narration of historical narratives does not pursue grand theoretical claims, but rather draws on and strives to highlight the linguistic details that inspired and reinforced political identities everywhere.

Political rhetoric projects and reinforces self-definitions and divisions into distinct groups of us and them on two levels: as a mirror that reflects and shapes public perception and as performance. In this section, therefore, we take a closer look at political speeches, propaganda, and popular commentary to explore how discursive rhetoric contributes to the formation and consolidation of political identities.

This section unpacks the linguistic activity that occurs in political speeches, propaganda, media discourse, etc.: trying to identify recurring patterns, linguistic strategies and persuasive devices used to identify specific groups of people. It draws on rhetorical theory and discourse analysis [8, 10] to illuminate the subtle ways in which language can be used to establish, contextualize and legitimize political identities.

Not only is this an analysis of language that combines an examination of rhetorical form with an analysis of social meaning and effect, but it also pays particular attention to the far-reaching implications of the rhetorical dimension of identity formation, constantly anchoring it in performative aspects of political discourse. How do speakers and media discourses actively shape the way audiences see and are seen, and how do they continually attempt to create and maintain collective political identities? If we follow Erving Goffman's approach in The Presentation of Self in Everyday Life [12], where identity, interaction, and action are theorized in dramatic terms in order to be useful for the analysis of social behavior, we can Seeing this approach illuminates what political communication is before dramatization, with actors expressing identity through language.

This section contributes to a nuanced understanding of the complex processes of constructing and reinforcing political identities by systematically analyzing language as a means of definition and the role of political rhetoric in identity formation.

5 Case Studies

There are many other stories in which language helped create and solidify political identities. The creation of the Italian nation-state in the nineteenth century is perhaps the most famous example. Subsequent efforts at language standardization by Giuseppe Mazzini and Alessandro Manzoni unified Italy linguistically, most notably the choice of Tosca. The Italian dialect serves as a standardized Italian language, which helps to promote and confirm Italian identity. This use of Tuscany was not only a linguistic device, it also had symbolic value and promoted the national project of Italy. It helped create a unique Italian political identity [5].

During the period of Italian unification, our historical examples show that the attempt and implementation of linguistic strategies of unification and standardization went beyond mere linguistic standardization. Creating a common language is not just about who speaks standard Italian, but also how a specific linguistic universe can be customized by selectively adopting linguistic elements from different regional varieties. The aim is to simultaneously create a sense of inclusion and ethnolinguistic identity. Historical examples illustrating this deliberative process are a good reference

point for a thorough analysis of language planning strategies and reveal the extent to which language has the capacity to define political identity on a large scale.

The Scottish independence movement is a particularly interesting case study: we can see how the use of language (which highlights Scotland's linguistic identity) in the media and in political discourse and campaign speeches creates and reinforces a new, distinct Scottish political identity. The distinctiveness of Standard British English in expressing Scottish linguistic identity is intended to promote Scottish national pride and highlight speakers within Scottish political identity. For example, the SNP's strong emphasis on linguistic distinctiveness, particularly the spread of Scots and Scots Gaelic, can be seen as a concerted effort to strengthen the political identity of an independent Scotland.

The Scottish independence movement sheds interesting light on the role of language in shaping and constraining contemporary political identities. Therefore, we should seriously consider whether artificial intelligence can be used to improve decision-making between agents. This is consistent with what we have discussed so far. Artificial intelligence and decision-making have a natural synergy. Artificial intelligence can help make decisions faster and more accurately as it helps analyze and understand information more effectively, thereby improving the quality of decisions when setting goals.

On the other hand, cybersecurity can be further improved through the use of artificial intelligence, according to new research. In the current information technology environment, the risks people face when using electronic devices are increasing at an unimaginable rate. Cybersecurity fills the gap and manages the risks associated with protecting sensitive and personal information on the Internet and other online services. Most importantly, the reason for maximizing cybersecurity is to combine artificial intelligence with cybersecurity, as this combination provides us with the highest level of security and neutralizes cybersecurity. These hateful messages created division, distrust and fear between ethnic groups, culminating in genocide and the systematic murder of more than half a million people in just three months. This historical event is worth studying because it allows us to more clearly analyze the harmful effects of the strategic use of words in the construction of political identities.

So when looking at language manipulation, we must also ask difficult questions about its ethics and possible long-term consequences. Consider the consequences. The manipulation of language used to pursue political goals raises ethical questions. The manipulative distortion or misuse of language involves the exploitation of signaling mechanisms (modes of communication that have significant consequences for society as a whole). Even viewers with strong political resolve.

6 Conclusion

By analyzing the myriad and complex ways in which language is both a mirror and an active agent in creating and reinforcing political identities, this study draws on theories from linguistics and sociology to provide a solid foundation for the study of

mobility and political identities. Over the centuries, a dynamic interaction has been established between language and the creation of identity. We fascinately examine the ways in which language is used as a boundary or marker, building on examples from our own time and the distant past, and our analysis aims to diagnose the many aspects of the complex interplay of language and political positions over time. Historical examples, the unification of Italy or the Rwandan genocide, illustrate the continuing importance of language to political entities, while contemporary political examples, such as the Scottish independence movement, highlight the role that language decisions still play in shaping them and political entities. Political identities are strengthened as the currents of modern politics deepen divisions among peoples. Each case study provides insights into the understanding and purposeful use of language, symbolic expressions and actions that can become part of the complex web of political identity creation. Reflecting on the risks of manipulating language captures the central ethical issues in decision-making faced by political actors and highlights the extent to which the misuse of language can undermine social cohesion. In order to interrogate these challenges, it is necessary to pay more attention to ethics and promote public discussion to place greater emphasis on the impact that language manipulation can have on the creation and reinforcement of political identities. As we look to the future of language and political identity, it is important to recognize that the profound shifts in language interactions brought about by the digitization of social media and advertising have intensified the dynamic interplay between language and politics. Going forward, future research must remain alert and attentive to the complex role that language plays in the fluid creation and reinforcement of political identities. For many steps to come, this remains a central invitation for cross-field and interdisciplinary research to understand how language and political identity come together as a feature of contemporary political and social dynamics.

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Impact of Transformational Leadership on Organizational Creativity Case Study of a Food and Drug Administration

Amer Alsaraireh and Ahmed Mohamed Awad

Abstract The study aims to identify the impact of transformational leadership on organizational creativity: (Case study: The Jordan Food and Drug Corporation), which relied on analytical descriptive methods. It was selected based on its suitability for achieving the study objectives and its population consisted of (747) male and female employees of Food and Drug General Corporation. The thorough survey method was utilized to gather data for the research project., with a response rate of (38%), representing (285) males and females. One of the most notable findings of the study was that transformational leadership is statistically significant for organizational creativity. This study recommends that the institution's management continue to develop the dimension of "intellectual stimulation" of leaders since it has a great impact on organizational creativity. Moreover, in order to achieve organizational creativity, the study recommends enhancing the dimension of "ideal influence" as one dimension of transformational leadership, as well as consolidating both problem analysis and sense of problems as dimensions of organizational creativity.

Keywords Organizational creativity · Transformational leadership · General corporation for food and drug

1 Introduction

The rapid, sudden and dynamic environmental changes experienced by organizations in all their fields, in addition to the great development in communication and information technologies, and the widespread spread of knowledge among individuals, led to the need for organizations to face these challenges by searching for appropriate

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management and leadership methods, and reconsidering concepts [15]. Traditional leadership to ensure survival and continuity, and to achieve goals efficiently and effectively [17].

Organizations' ability to address environmental challenges depends to a large extent on their leadership style [19]. As the leaders of the organization must have the ability to use the leadership style appropriate to the situation and the event, the traditional leadership styles: dictatorship, democracy and autocracy … etc., have produced other styles that are more flexible to deal with the developments of the times [27].

And because leadership is the spirit of contemporary management, and the focus of organizations' activities, traditional leadership patterns produced a modern pattern at the end of the twentieth century at the hands of the world (Games Burns) called transformational leadership, as researchers considered this pattern to be one of the most influential leadership patterns in employees and working conditions alike [7, 23].

Transformational leadership is associated with many management concepts concerned with investing the energies and capabilities of employees, as it is closely related to creativity, which represents the process of generating valuable innovative ideas in the organization [11]; Organizations that adopt organizational creativity are more capable than others in achieving their goals and obtaining a competitive advantage [24, 30]; The higher the organization's ability to accept challenges, the higher the rate of creative ideas generation [14, 29].

1.1 Problem of the Study

The ingenuity of the transformational leader appears in his perception of the possibility of transforming the circumstances surrounding the organization, and the dangers they bear, into opportunities through which the creative capabilities of the employees are launched, which invest these conditions and turn them into an opportunity by reformulating them, finding innovative solutions, and successfully managing situations. The transformational leader can create creative perceptions and solutions to problems [4], and the transformational leadership theory relies mainly on the principle of motivation. Transformational leaders seek to provide incentives for employees that support their morale and activate values in them, and stimulate their thinking to find unusual creative solutions, as well as activate their creative spirit and their ability to solve problems that they encounter during their work; with a view to raise the organization's performance level and accomplish its goals [6].

Organizational creativity is considered one of the main driving factors to increase the competitiveness of organizations in the long term in competitive markets, and a means to overcome internal or external environmental pressures, as it comes in response to pressures: (competition, scarcity of resources, customer demands…) or due to the use of internal organizational options such as Acquiring distinguished skills and reaching a high level of ambition, as it is an accurate criterion for the process of change, and a motive for extracting the best in the individual, to contribute

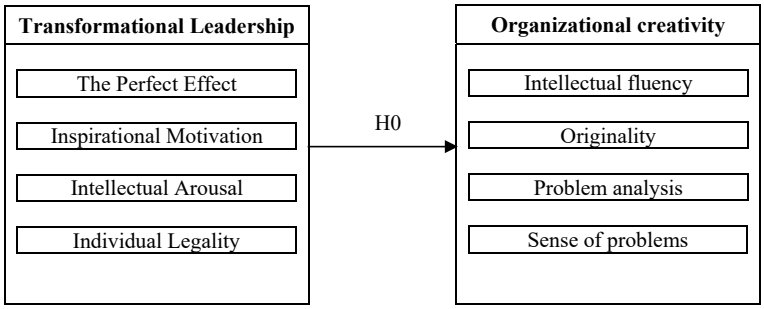


Fig. 1 Study model. *Source* Previous Studies: [1, 28]

to providing distinguished services to beneficiaries that exceed their expectations, enhance the work environment, and save time and effort [25].

Given the importance of transformational leadership and organizational creativity of the Food and Drug Administration in Jordan and similar institutions, and due to the lack of studies in this aspect and the ambiguity of the impact between these two variables; The problem of the study can be developed in examining the impact of transformational leadership on organizational creativity in the Jordan Food and Drug Administration Fig. 1.

1.2 Study Hypothesis

- H0: There is no statistically significant effect at the level of significance ($\alpha \leq 0.05$), for transformational leadership with its dimensions combined: (ideal influence, inspirational motivation, intellectual stimulation, individual legality), on organizational creativity in the Jordan Food and Drug Corporation.

2 Theoretical Framework

2.1 Concept of Transformational Leadership

Transformational leadership is defined as "the process by which a person interacts with others and creates a connection that raises the level of motivation and ethics in both the leader and the follower" [20]. It is "leaders entering into an interactive relationship with followers, making leaders more active and able to find new ranks From the leaders" [8], and it is "a process based on the relationship between the transformational leader and the subordinates, and what distinguishes it is the interaction between them, which is reinforced by the communication process between the sender (the leader) and the receiver (the subordinate), through a message that carries

elements that must be available in the leader Influencing, motivating, inspiring and making a comprehensive change, in addition to the vision and future perception of the organization" [12].

2.2 Dimensions of Transformational Leadership

Perfect Effect

The leader has the ability to gain the admiration, trust and appreciation of employees, as they consider him their ideal, and work to imitate him and obey him in all his decisions. The concept of ideal influence is closely related to the concept of charisma and charismatic leadership. The leaders are admired, appreciated, and trusted, as this leader has high levels of perseverance, morale, and moral values that make everyone gather around him and are influenced by him. For his personal interests, [9].

Dimensions of Motivation (Inspirational Motivation)

It is the ability to spread movement, awareness, and motivation among subordinates. An inspiring leader can set difficult goals within an achievable framework, and usually possesses sensitivity and understanding of the environment in which he works, and an understanding of the capabilities, needs, and aspirations of others, so that he can employ this understanding in spreading the spirit of work, activity, and positive challenge. It relies on inspirational motivation and has the ability to motivate subordinates to a higher level of performance.

Intellectual Stimulation (Creative Encouragement)

It refers to the innovation of the transformational leader for new ideas that stimulate subordinates to identify problems and provide solutions to them in creative ways and support new and creative models of business performance. These leaders raise new ideas, encourage subordinates to solve problems in a creative way, and support creative approaches in getting work done [2].

Individual Consideration (Concern for Individual Feelings)

It is the set of behaviors through which the leader can give personal attention to each subordinate, by recognizing the level of needs and desires of all his subordinates and considering the individual differences between subordinates when satisfying these needs. Caring for individuals is a service, sacrifice and altruism of transformational leadership, [18].

2.3 Organizational Creativity

Chaubey and Sahoo [13] believes that creativity in the organization differs from the concept of creativity in general and is called organizational creativity, which is "proposing or adopting a completely new idea independent of a good, service, system, activity, policy or method that may come from within or outside the organization".

Al-Faouri [3] confirms that organizational creativity is "a process of adopting a new idea or behavior in the organization, whether it is a new product or service, or a new technology, or a new management practice, and it depends on the speed of the organization in adopting more than one of these types".

Al-Dahisat [5] introduces him to creating new ideas that are far from the traditional context of thinking, and introducing all methods and methods that would transform these ideas into an applied reality of value.

2.4 Dimensions of Organizational Creativity

Originality

It expresses thinking outside the box while preserving the originality of these ideas, as well as the ideas that generated and matured these new ideas, which have become a new, developed and rare reality for the organization. Mentioned that the originality of ideas is distinguished by modernity, that is, to be an unprecedented idea, and the originality of ideas is also distinguished by its transcendence of reality because it is characterized by active imagination and the gathering of divergent elements.

Fluency

It is to give and provide as many ideas as possible on a specific topic and in a certain period of time. Fluency also refers to generating the largest number of ideas and suggestions on an issue. It is a quantitative aspect of creativity, unlike flexibility. It is the ability of an individual to make ideas flow easily with the aim of obtaining a large number of them during a specific time. Fluency can be measured through the speed to present the largest number of ideas, quickly categorize ideas into categories, or categorize them according to specific requirements [21]

Sensitivity to Problems

It is "the ability to recognize weaknesses and gaps in a situation" [10]. It also indicates the ability of the creative employee to see many problems in one situation, so he can clarify the errors in the things that surround him, and he can realize the deficiencies and deficiencies in them.

Problem Analysis

It is the creative or innovative production, and includes the process of selecting any new work and dividing it into simple units to be reorganized [22].

2.5 Literature Review

Al-Sharif's study [27] titled "Transformational Leadership and its Impact on Administrative Creativity among Workers in Commercial Banks Operating in Palestine" aimed to identify transformational leadership and its impact on administrative creativity for workers in public commercial banks in Palestine, based on the descriptive approach. The study concluded that (ideal influence, inspirational motivation, intellectual stimulation, individual legality) are the dimensions of transformational leadership that have the most impact on administrative creativity. And that the empowerment of workers has no effect on administrative creativity, and the study recommended the need to pay attention to qualified and trained cadres who have the initial readiness for transformational leadership and focus on developing change leaders in banks.

Boumshata's study [12] entitled "The Impact of Transformational Leadership on Activating Organizational Creativity" aimed to identify the impact of transformational leadership on activating organizational creativity in several Algerian organizations based on the descriptive analytical approach. The study concluded that there is a link between transformational leadership and organizational creativity, and there is an impact of transformational leadership on activating organizational creativity.

In the same context, [16] study "The Impact of Transformational Leadership on Employee Creativity: The Role of Orientation to Learning" aimed to explore the relationship between transformational leadership and employee creativity, and to know the mediating role played by learning orientation in the relationship between transformational leadership and employee creativity in Indian telecom companies. Structural Equation Modeling (SEM) has been done in two steps. The study found that, when directed learning is used to supervise creativity, there is a positive correlation between transformational leadership and employee creativity.

3 Methodology

This study adopts the descriptive analytical approach based on the use of a model extracted from previous studies and testing it by developing a questionnaire that measures the variables represented by the model, collecting data using a comprehensive survey, and then testing the hypotheses of the study through the use of the statistical analysis program (SPSS, 222).

3.1 The Study Population

The study population includes all (747) employees of the Saudi Food and Drug Administration, male and female, as the study relied on a comprehensive enumeration

method to collect data from the study population, due to the small size of the study population. As the total number of completed and valid surveys (285), with a rate of (38.1%) after distributing them via e-mail.

3.2 Research Instrument

After consulting earlier research to meet the study's goals, [9, 28], the study tool was formulated to measure the impact of transformational leadership on the organizational creativity of the Jordan Food and Drug Corporation. The study tool consists of three main axes.

3.3 The Stability of the Study Tool

The stability of the tool used in measuring the variables of the study tool was confirmed by calculating the value of (Cronbach's Alpha) coefficient.

We note from the data presented in the previous Table 1, that the test value ranged between (0.761–0.862). And a total index for all items was (0.778), all of which are greater than (0.70), which indicates the stability of the study tool [26]

Table 1 coefficient (Cronbach Alpha) to test the stability of the study tool

Study variables	Variable type	Cronbach alpha	No of items
The perfect effect	Independent	0.761	5
Inspirational motivation		0.793	5
Intellectual arousal		0.828	5
Individual legality		0.780	5
Transformational leadership		0.862	20
Intellectual fluency	Dependent	0.809	5
Originality		0.775	5
Problem analysis		0.821	5
Sense of problems		0.756	5
Organizational creativity		0.861	20
The total items of the study tool		0.778	40

3.4 Testing the Study Hypotheses

- **The main hypothesis (H0):** There is no statistically significant effect, at a significant level ($\alpha \leq 0.05$), of transformational leadership with its dimensions combined: (ideal influence, inspirational motivation, intellectual stimulation, individual legality), on organizational creativity in the Saudi Food and Drug Corporation. This hypothesis was tested in the study using the multiple linear regression, and the results are displayed in Table 2.

Table 2 indicates that the value of (F) was 461.111, with a significance level of (0.00), indicating that it was less than the level of significance (0.05); Which means rejecting the null hypothesis that says: "There is no statistically significant effect at the level of significance ($\alpha \leq 0.05$) of transformational leadership with its dimensions combined: (ideal influence, inspirational motivation, intellectual stimulation, individual legality), on organizational creativity in the Food and Drug Administration." Instead, we agree with the alternate hypothesis that follows: A significant effect is present at a significant level ($\alpha \leq 0.05$) for transformational leadership with its dimensions combined: (ideal influence, inspirational motivation, intellectual stimulation, individual legality), on organizational creativity in Saudi Food and Drug Corporation. We also conclude from the previous table 20 that the independent variable's dimensions have an effect regarding the dependent variable: (organizational creativity in the Saudi Food and Drug Administration), given that these dimensions accounted for 86.8% of the variations in the dependent variable.

Table 2 Multiple linear regression analysis

Dependent variable	R	R2	F	Significance	The I. V	B	t	Significance
Organizational creativity	0.932	0.868	461.111	0.00	The perfect effect	0.047	1.068	0.287
					Inspirational motivation	0.147	2.769	*0.006
					Intellectual arousal	0.481	9.533	*0.000
					individual legality	0.309	6.898	*0.000

*significant statistically at a level of significance ($\alpha \leq 0.05$)

4 Findings

1. The results showed that there is a statistically significant effect at the level of significance ($\alpha \leq 0.05$) for transformational leadership with its dimensions combined: (ideal influence, inspirational motivation, intellectual stimulation, individual legality) on organizational creativity in the Food and Drug Administration.
2. It also demonstrated that the ideal effect on organizational creativity in the General Organization for Food and Drug had a statistically significant effect at the significance level ($\alpha = 0.05$).
3. It proved the existence of a statistically significant effect at the level of significance ($\alpha = 0.05$) for inspirational motivation on organizational creativity in the General Organization for Food and Drugs.
4. It also proved that there is a statistically significant effect, at the level of significance ($\alpha = 0.05$), for intellectual stimulation on organizational creativity in the Food and Drug Administration.
5. The results showed that there is a statistically significant effect, at the level of significance ($\alpha = 0.05$), of individual consideration in organizational creativity in the General Organization for Food and Drug.

4.1 Recommendations

In light of the previous results, the study recommends the following:

1. The Food and Drug Administration continues to develop the dimension (intellectual stimulation) of the leaders, due to its great impact as one of the dimensions of transformational leadership in achieving the organizational creativity of the institution, through holding training workshops and panel discussions.
2. Shedding light on inspirational motivation as one of the dimensions of transformational leadership that has an impact on organizational creativity by holding leadership qualification programs before assigning them.
3. Devoting efforts to enhance the (ideal influence) dimension as one of the dimensions of transformational leadership in achieving organizational creativity for the Food and Drug General Corporation through periodic meetings between the leadership and employees of the corporation.
4. Emphasizing the importance of individual legality among the leaders of the Food and Drug General Corporation, due to its clear impact on organizational creativity, through the flexibility of procedures that facilitate the delegation of powers to employees.
5. Focusing on the skills of intellectual fluency and originality as dimensions of organizational creativity when practicing transformational leadership by focusing on employee ideas and supporting them through competition between them.

6. Enhancing the efforts of the Food and Drug Administration to support the skill of problem analysis through the participation of employees in the problems that the institution faces.
7. Increase the interest of the Food and Drug Administration; To highlight the employee's problem-sensing skill as one of the dimensions of organizational creativity by presenting previous problems and solutions that have been reached, and the signs of these problems.
8. The study recommends that the researchers carry out the subsequent investigations: examining the relationship between the identical variables in this study in private enterprises and contrasting the outcomes with the findings of the current investigation., adding the dimension of empowering employees as one of the dimensions of transformational leadership and applying it to a Jordanian government agency, and studying the dimensions of participatory leadership in achieving organizational creativity.

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The Impact of Service Quality Provided by Civil Society Organizations on Beneficiary Satisfaction: The Jordanian Hashemite Fund for Human Development as a Case Study

Zakaria Azzam and Thuraiya Alkhuzam

Abstract The objective of this study is to present a theoretical overview and conceptual framework regarding service quality and satisfaction. Furthermore, it aims to demonstrate the influence of service quality provided by civil society organizations, specifically the Jordanian Hashemite Fund for Human Development (JHFHD) in Jordan, on achieving beneficiary satisfaction. The study employs a descriptive analytical approach and gathered data from primary and secondary sources. A total of 530 questionnaires were distributed to beneficiaries of the organization's services, resulting in a retrieval rate of approximately 92% with 490 questionnaires retrieved. After excluding 24 invalid questionnaires, 466 questionnaires were deemed suitable for analysis, representing a response rate of 95%. The study's findings indicate that all dimensions of service quality provided by The Jordanian Hashemite Fund for Human Development (transparency, trust and security, excellence and proficiency, confidentiality and privacy, reliability, and professionalism) had a significant impact on beneficiary satisfaction, either collectively or individually. The study recommends placing a strong emphasis on the transparency dimension within the Fund to monitor service delivery and enhance its quality. Moreover, it stresses the importance of developing employees' skills and capabilities in resolving issues encountered during service delivery, as well as providing them with training on effectively serving beneficiaries.

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Keywords Service quality · Civil society organizations · Beneficiary satisfaction · Jordan Hashemite Fund · Transparency · Trust · Excellence · Confidentiality · Reliability · Professionalism

1 Introduction

In recent years, there have been significant advancements in the services sector, which has gained immense importance in national economies. This has resulted in intense competition among service providers, prompting researchers and stakeholders in service activities to acknowledge the significance of delivering high-quality services. JHFHD, like other service organizations, has placed a strong emphasis on ensuring beneficiary satisfaction and understanding their needs and preferences in order to provide services that meet their expectations and foster loyalty. This is crucial for gaining a competitive edge and increasing profitability through long-term investments in productive projects and lending portfolios, which generate revenue to sustain and thrive in the market. Given the fierce competition from both local and international organizations for foreign funding and support for various projects, programs, and activities, it has become essential for international and local organizations, ministries, and private sector companies to maintain competitiveness and secure additional funding, investments, and support. Furthermore, the technological revolution in information and communication has empowered beneficiaries to choose and benefit from services that align with their specific needs and desires. As a result, service organizations are compelled to enhance their service quality and diversify their offerings through influential strategies and by measuring beneficiary satisfaction levels. In these organizations, the provision of quality services is imperative for surpassing competitors based on key variables such as transparency, excellence, trust, confidentiality, reliability, and professionalism. By instilling confidence and satisfaction in beneficiaries, the organization establishes itself as their preferred choice.

During the era of economic globalization, Jordan, like many other nations, initiated its own process of economic globalization in the 1990s. As a result, the majority of its economic institutions were privatized. Consequently, civil society organizations, such as JHFHD, were compelled to adopt new roles in the realm of economic development. These roles included the planning and execution of medium and small-scale production projects, with the primary goal of generating employment opportunities, reducing unemployment rates, and enhancing the economic standing of individuals. By prioritizing sustainability and fostering partnerships with the private sector, this organization strives to offer programs and projects that benefit local communities. In addition, it plans to take advantage of the connection between Jordanian CSOs and international partners—seeking common funds for programs and projects. It also aims at acquiring external financial assistance, exchanging experiences that would promote economic empowerment, and developing an efficient management for small to medium scale projects.

JHFHD's main goal is to evolve the quality of its services beyond standard limitations. To reach this, they must create an environment in which feedback is highly encouraged; only through such a system can they bring effective reforms and foster development of their services with a view to achieving premium quality levels and satisfaction from those who benefit. As such, it becomes essential for JHFHDas a service-based organization to assess beneficiary satisfaction, which in turn serves multiple purposes: marketing itself to international organizations, securing funding for its programs and ensuring functionality among others. The survey results show that JHF has indeed put in place comprehensive principles for service delivery. They include covering areas like well-defined procedures with clear roles and responsibilities, tight control mechanisms, depicted through several checkpoints within the flow process. They also open channels where complaints or suggestions can be easily made and quick feedback provided back on actions taken as well as informal occasions organized periodically so that staff can meet directly with beneficiaries. In connection with the dimension of transparency recipients of its service expressed a moderate level of satisfaction.

1.1 Problem Statement

The triad that hinges on service quality for both non-profit and for-profit service organizations. One of the early pioneers of civil society institutions in Jordan is JHFHD, having a long history and wide range of services that have sustained its delivery over time due to its local standing. However, such local standing is not enough. The organization must also build an international reputation that portrays credibility, seeking support not only locally but globally where countless other organizations compete among themselves like rival suitors fighting over limited financial resources. The quality of assistance should be an integrated system at all levels within an organization, starting from securing basic operational needs towards gaining competitive advantage in their market place. Such a thing ensures not only their survival but growth. In turn, it should primarily focus on top-notch service delivery by realizing their importance through such partnerships with stakeholders who value their significance and contribute meaningfully toward what is required from them. And this becomes even more crucial in light of the escalating poverty and unemployment rates, as well as the influx of refugees into the region. These pose challenges for the organization to address the aspirations of its.

The researchers acknowledge the critical role of service quality in the success of Jordan Hashemite Fund. Given the intense competition among local civil society organizations for funding, investment, and project opportunities from international organizations, it is crucial for the organization to provide high-quality services. This is particularly important considering the increasing demands and responsibilities placed on JHFHD. Therefore, the main focus of the study is to examine the impact of various dimensions of service quality. This is addressed through the following questions:

- **Main Question:** What is the impact of service quality provided by civil society organizations, represented by the Jordanian Hashemite Fund for Human Development, in its dimensions on beneficiary satisfaction?

This main question branches out into the following inquiries:

1. What is the impact of transparency in services provided by JHFHD on beneficiary satisfaction?
2. What is the impact of trust and security dimension in the services provided by JHFHD on beneficiary satisfaction?
3. What is the impact of excellence and proficiency dimension in the services provided by JHFHD on beneficiary satisfaction?
4. What is the impact of confidentiality and privacy dimension in the services provided by JHFHD on beneficiary satisfaction?
5. What is the impact of reliability dimension in the services provided by JHFHD on beneficiary satisfaction?
6. What is the impact of professionalism dimension in the services provided by JHFHD on beneficiary satisfaction?

1.2 Importance of the Study

JHFHD, along with other civil society organizations, frequently encounters the need to stay abreast of modifications occurring in the external and marketing realms. Such alterations compel these organizations to adjust their service offerings in accordance with the shifting landscape and the evolving preferences of their existing beneficiaries. As the recipients of these services are the ultimate evaluators of quality and the degree to which their needs are fulfilled, the significance of this study becomes evident.

1.3 Study Objectives

The objective of this research endeavor is to present a comprehensive theoretical analysis and conceptual framework pertaining to the topic of service quality and satisfaction. Furthermore, this study seeks to illustrate the profound influence exerted by the quality of services offered by JHFHD on the overall satisfaction experienced by its beneficiaries.

From the main objective, the following sub-objectives stem:

1. Understanding the impact of the transparency dimension in services provided by Jordan Hashemite Fund on beneficiary satisfaction.
2. Understanding the impact of the trust and security dimensions in services provided by JHFHD on the satisfaction of beneficiaries.

3. Understanding the impact of the dimensions of excellence and proficiency in services provided by JHFHD on beneficiary satisfaction.
4. Understanding the impact of the confidentiality and privacy dimensions of services provided by JHFHD on beneficiary satisfaction.
5. Understanding the impact of the reliability dimension of services provided by JHFHD on the satisfaction of beneficiaries.
6. Understanding the impact of the dimension of professionalism in services provided by The Jordanian Hashemite Fund for Human Development on the satisfaction of beneficiaries.

1.4 Study Hypotheses

Based on the problem statement and objectives, the main hypothesis is formulated as follows:

- **H0**: "There is no statistically significant impact (at the significance level $\alpha \leq 0.05$) of the quality of services provided by JHFHD, in its dimensions, on the satisfaction of its beneficiaries."

1.5 Study Model

Drawing upon the problem statement and hypotheses, the researcher developed a comprehensive model that incorporated insights from various previous studies. Notable contributions include the works of [2, 3, 6, 8, 9, 11, 14, 18, 21], and others. This model was specifically designed to assess the influence of service quality dimensions offered by JHFHD on the level of satisfaction experienced by beneficiaries Fig. 1.

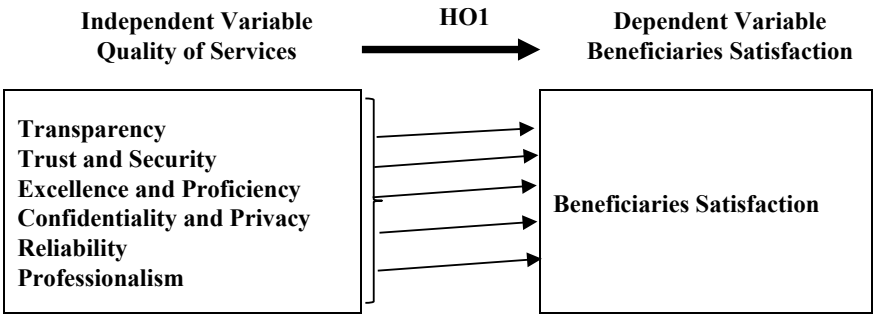


Fig. 1 Study model

1.6 Terminological Definitions

- Service: It is an activity or benefit that one party can offer to another that is essentially intangible and does not result in ownership of anything [22].
- Quality: It is a comprehensive, practical approach aimed at meeting customer needs and expectations through quantitative methods of continuous improvement of processes and services.
- Satisfaction: It is the joy experienced by the beneficiary when he or she achieves the desired satisfaction and what he expected to gain in the form of benefits. Satisfaction is created by comparing what the beneficiary expects to receive with what he or she actually gets.
- Civil society organizations: These are independent formations established independently of the government, with the right to create and find the necessary resources to finance their activities by raising funds from local and international organizations and private sector enterprises, and investing in productive projects that constitute a source for them income [4].
- Jordan Hashemite Human Development Fund: It is a leading independent non-governmental organization chaired by Her Highness Princess Basma bint Talal, which aims to promote social development and improve the economic level of individuals, provide employment opportunities to the unemployed in order to reduce the number of unemployed people and seeks to generate income by marketing itself and building a good reputation in order to finance developmental and productive programs and projects from international organizations, grants and aid.
- Transparency: It refers to the flow of information in a way that allows everyone among staff and beneficiaries to have access to data and to have access to information and mechanisms for policy-making and appropriate decision-making. The organization's activities should be characterized by clarity, openness, transparency and according to a set of variables (information systems, communication, control and responsibility, participation, procedures) [20].
- Trust and security: It is the ability of the service provider to provide services to the beneficiary in the safest and most risk-free environment possible and to inspire trust and security. Security is one of the things on which the beneficiary relies to judge the quality of the service, because the beneficiary always prefers an institution that provides a certain degree of security (Sweed, 2010).
- Excellence and Proficiency: It means the ability of an organization to deliver services free from deficiencies, defects and errors, with efficiency, accuracy and proficiency. It is considered the epitome of quality work and the pinnacle of precision and excellence as much as Competencies, skills, analytical and deductive abilities and knowledge enable them to perform their roles optimally [25].
- Confidentiality and privacy: It means the ability of the organization to establish rules governing the process of managing the confidentiality of data and information belonging to beneficiaries and allowing access only to specialists and entities associated with them and maintaining the privacy of this information.

- Reliability: It is the ability of an organization to perform or deliver a service exactly as promised, meaning that it should be reliable and highly accurate because the service recipient expects to receive the time- and performance-precise service exactly as promised, relying on the service provider for its operation.
- Professionalism: It means the ability of an organization's employees to apply labor law and ethics in a professional manner, based on a foundation of knowledge and excellence in providing high-quality, defect-free service. It also means the ability to perform a specific task in a specific way, translating professional knowledge and values into actions and procedures aimed at meeting customer needs and helping to solve their problems [5]. Procedurally, it is defined based on the above as the ability of Jordan Hashemite Fund employees to provide outstanding service to beneficiaries in a skillful, excellent, professional and error-free manner.

2 Theatrical Framework

2.1 Dimensions of Service Quality Provided by JHFHD

The dimensions of service quality offered by the Jordanian Hashemite Fund closely align with the quality dimensions identified by experts in the field of services in private business organizations. Extensive studies and research have delved into the concept of quality from various perspectives, including those of the service recipient, the labor market, the service provider organization, and the value attributed to the service. Numerous researchers have reached the consensus that quality encompasses multiple dimensions, with each dimension focusing on a specific set of criteria when evaluating the quality of the service received. While there may be some variation among researchers regarding the exact number of fundamental quality dimensions, it is crucial for organizations to thoroughly examine and analyze all dimensions explored by researchers in order to determine which dimensions are most relevant to their institution and align with the concerns of the service beneficiaries.

By referencing the aforementioned studies [1, 2, 13, 24], and conducting a thorough analysis, the researchers are able to contribute to the existing body of knowledge by identifying six primary dimensions that define quality:

Transparency

Transparency has emerged as an essential prerequisite in the realm of administrative and organizational operations, particularly for organizations aspiring to enhance their services to a level of sophistication that positively impacts the quality of services provided to individuals. The achievement of transparency necessitates several requirements. They include imperative for administrative growth in organizational management, the alignment of training programs with organizational needs, the establishment of an extensive information network among administrative units within

the organization to ensure seamless coordination, cooperation, and procedural accuracy, as well as the reinforcement of supervisory functions to bolster transparency [7, 10, 12, 19].

The primary objective of implementing transparency within the Jordanian Hashemite Fund is to establish a conducive and appealing workspace that ensures all beneficiaries are subject to equitable standards and criteria. This is about transmitting information in a way that flows effortlessly, ensuring every department involved in service delivery is well enlightened on what their role entails, able to see clearly where revenue is coming from and easily facilitated through financial arrangements. This means no confusion or disorder that might cripple other well-intentioned efforts within the organization.

Trust and Security

The dimension under consideration is related to the service provider's competencies, proficiencies and expertise. The establishment of trust and confidence with the receiver is crucial for success. The capacity of the Jordanian Hashemite Fund to offer services to the recipients in a secure and safe manner without any risk involved provides trust and safety for the recipients. It is considered a major guarantee element that people are looking for as part of quality service delivery. Generally, people are attracted to organizations that make them feel safe (both physically and psychologically) as they are seeking protection from harm.

Excellence and Precision

The Jordanian Hashemite Fund must ensure delivery of services without any deficiencies, defects or errors, yet maintaining efficiency, accuracy and professionalism at every level which depicts high precision. Completeness and perfection should be their aim at all instances. The service provider's performance relies heavily on skill set as well as analytical and inferential abilities apart from the knowledge they bring onboard aimed towards optimal performance [17]. Recipients' first contact with service providers is evaluated by beneficiaries based on factors like academic qualifications, practical experiences and official accreditation sources. Some recipients would prefer getting services from highly educated individuals coming from official sources that are accredited.

Confidentiality and Privacy

The ability of the Jordanian Hashemite Fund to develop rules that will keep the managing beneficiaries' data confidential by only allowing access to experts and concerned parties but still protecting the privacy of this information has been recognized [15].

Reliability

For The Jordanian Hashemite Fund, the ability to provide services with precision and dedication is more than just meeting deadlines. It is also about ensuring the trust of the recipients who depend on these services being carried out as agreed upon [16].

Professionalism

The ability of the staff members at the Jordanian Hashemite Fund in following ethical principles and legislations effectively, along with codes of conduct, is a sign of their commitment to quality service without errors and also shows that they are capable of carrying out their tasks with professionalism. This means that we need to turn our professional knowledge and values into actions, through specific procedures or protocols aimed at fulfilling the needs of the beneficiaries who approach us for assistance in addressing their issues [19].

The study has incorporated the civil organizations outlined in Table 1, with the data presented in the table pertaining to the various categories of civil society organizations in Jordan.

The study is about the Jordanian Hashemite Human Development Fund. It belongs to the group of independent civil society organizations which are platforms for people to voice their needs and hopes. In response, the Fund tries to meet these identified needs through already set criteria and benchmarks. The Fund's way of doing things involves a systematic method to evaluate impact, quality, and effectiveness with measurable indicators. They make sure that they can touch, feel or count what they are seeing in order to come up with numbers related to the service output that paints a full picture regarding its outcome reality.

Table 1 Distribution of civil society organizations in Jordan

No.	Category	Number	Percentage of total organizations (%)
1	Civil society organizations	2540	53
2	Political organizations	110	3
3	Professional syndicates	14	0.5
4	Labor unions	17	0.5
5	Various private sector organizations	98	3
6	Cultural entities	566	10
7	Non-Profit companies	449	9
8	Sports and youth clubs	337	8
9	Human rights organizations	9	0.3
10	Political parties	25	0.5
11	Environmental associations	60	1.2
12	Family associations and links	546	11

Source [4]

3 Study Methodology

The reason behind choosing the descriptive-analytical approach in this research is due to its compatibility with the research aims and appropriateness for gathering data from a vast population under study. Through this approach, considerable amount of information is collected; it also uses statistical methods to find out the importance of different variables, which include both independent and dependent variables, and even determine frequency distributions as well as percentages.

3.1 Study Population

This research's control group is those who are aided by the Jordanian Hashemite Human Development Fund and its beneficiaries situated in all governorates of the kingdom. The fund has fifty centers distributed among three regions: Northern, Central, and Southern. According to data sourced from the Jordanian Hashemite Fund, it can be approximated that the number of recipients during 20215–2022 was close to a hundred thousand.

3.2 Study Sample

The study by [23] used a simple random sampling technique where 530 questionnaires were sent to people who have used the Fund services in the three regions: Northern, Central, and Southern. Of these, 490 questionnaires were returned, resulting in a retrieval rate of approximately 92%. The successful retrieval of a high number of questionnaires can be attributed to the collaborative efforts of the center managers and their staff, as well as the researchers' diligent follow-up with the participants. These measures facilitated effective communication with the service recipients and ensured the retrieval of the questionnaires.

Following the completion of data entry, a thorough examination was conducted to validate the responses provided by participants, ensuring the precision of the collected data and the sincerity of participants' answers to the questionnaire items. As a result, a total of (24) questionnaires were deemed ineligible for analysis. Consequently, (466) questionnaires were deemed suitable for further investigation, constituting approximately 95% of the total number of questionnaires obtained. A comprehensive overview of the questionnaire retrieval and acceptance rates is presented in Table 2.

Table 2 Summary of questionnaire distribution, retrieval, and acceptance rates

Questionnaires distributed	Percentage (%)	Questionnaires retrieved	Percentage (%)	Questionnaires accepted for analysis	Percentage (%)
530	100	490	92	466	95

3.3 Study Tool

Following the identification of the research problem, questions, and hypotheses, the researchers proceeded to create and enhance the research instrument, which encompassed all variables of interest. The questionnaire was chosen as the most suitable tool to effectively address the objectives of the study. Its construction was informed by an extensive review of pertinent literature and previous studies, guaranteeing that its contents were congruent with the identified study variables.

Test Reliability

The second assessment for evaluating the study tool is Cronbach's alpha, which assesses content validity and measures the consistency among the items in the study tool. Additionally, it verifies the stability of the study tool, indicating its suitability for measuring variables. The study reliability can be assessed using the Cronbach's alpha coefficient, with values greater than 0.60 deemed satisfactory as suggested by [23]. Findings of the Cronbach's alpha coefficients can be seen in Table 3.

The reliability of the study's items was assessed using Cronbach's alpha coefficients, as shown in Table 3. It is apparent that all of the coefficients exceeded the minimum acceptable value of 0.60, indicating satisfactory reliability of the measurement tool. The overall reliability coefficient for the entire tool was calculated to be 0.879, suggesting a high level of consistency and stability among the study's items.

Table 3 Results of consistency reliability coefficients through Cronbach's alpha for study variables and overall tool

Variables	Number of items	Measurement items	Cronbach's alpha coefficient
Transparency	6	Q1–Q6	0.73
Trust and security	5	Q7–Q11	0.77
Excellence and precision	5	Q12–Q16	0.751
Confidentiality	5	Q17–Q21	0.81
Reliability	6	Q22–Q27	0.729
Professionalism	6	Q28–Q33	0.785
Beneficiaries' satisfaction	8	Q34–Q41	0.82
Overall tool	41		0.879

Among the different variables, the reliability items demonstrated the lowest Cronbach's alpha coefficient of 0.729. Conversely, the satisfaction of beneficiaries' items exhibited the highest coefficient of 0.82, indicating the greatest level of stability among the study's items.

3.4 Description of Study Sample Characteristics

The study sample exhibited diversity in terms of demographic characteristics, encompassing five distinct attributes: gender, age, educational level, frequency of service utilization, monthly income level, and the locations where the questionnaires were distributed. The findings pertaining to these attributes are presented in Table 4.

The predominant demographic characteristic observed in the study is gender, with findings revealing a higher participation rate among females, accounting for 51.7% of the participants. Conversely, males constituted 48.3% of the participants. These results imply that JHFHD has a primary focus on engaging females in the majority of its programs and services, while also implementing certain projects that exclusively cater to the needs of women.

Regarding the second characteristic, the participants' ages were categorized into four groups: below 25 years old, 25 to below 35 years old, 35 to below 45 years old, and 45 years old and above. Notably, the age group below 25 years old exhibited the highest rate of participation in the study, surpassing 33%. Following closely behind was the age group of 25 to below 35 years old, which had a participation rate of 28.8%. Conversely, the age group of 45 years old and above had the lowest participation rate, approximately 16%. This data suggests that JHFHD prioritizes the youth population when delivering various programs, services, and activities such as IT, youth capacity building, employment opportunities, and life skills programs.

In terms of educational attainment, the participants were divided into four distinct groups: individuals with education below the general secondary level, those with an intermediate diploma, individuals holding a bachelor's degree, and those who have pursued postgraduate studies. Notably, the group with education below the general secondary level exhibited the highest rate of participation, accounting for 40.8% of the total participants. Conversely, individuals with postgraduate studies displayed the lowest rate of participation, with a mere 8% representation. This discrepancy can be attributed to the fact that many of the fund's centers are situated in economically disadvantaged areas, where the majority of residents face financial constraints that hinder their pursuit of higher education.

JHFHD offers a wide range of services to its beneficiaries, which may be provided once or multiple times depending on the specific projects associated with each service. In order to assess the frequency of service utilization by the beneficiaries, the researchers measured the extent to which the services were used. The majority of participants in the study received the service on a single occasion, with a participation rate surpassing 32%. Conversely, the least common frequency of service usage was twice, with a participation rate of 15.7%.

Table 4 Description of study sample characteristics

Study sample characteristics	Categories	Number	Percentage (%)
Gender	Male	225	48.3
	Female	241	51.7
	Total	466	100
Age	Below 25 years old	155	33.2
	25–below 35 years old	134	28.8
	35–below 45 years old	102	21.9
	54 years old and above	75	16.1
	Total	466	100
Educational level	Below general secondary	190	40.8
	Intermediate diploma	68	14.6
	Bachelor's degree	171	36.7
	Postgraduate studies	37	7.9
	Total	466	100
Frequency of service usage	Once	151	32.4
	Twice	73	15.7
	Three times	97	20.8
	Four times or more	145	31.1
	Total	466	100
Monthly income level	Less than 150 JD	115	24.7
	150–Less than 250 JD	117	25.1
	250–Less than 350 JD	128	27.5
	350 JD and above	106	22.7
	Total	466	100
Questionnaire distribution sites	Northern region	183	39.3
	Central region	165	35.4
	Southern region	118	25.3
	Total	466	100

In relation to the final characteristic, the monthly income level was categorized into four distinct groups: less than 150 JD, 150 to less than 250 JD, 250 to less than 350 JD, and 350 JD and above. Notably, the income bracket of 250 to less than 350 JD exhibited the highest rate of participation, standing at 27.5%, whereas the income group of 350 JD and above displayed the lowest rate of participation, amounting to 22.7%. This phenomenon can be attributed to the prevalence of low-income individuals within the target demographic, primarily employed in government positions, factories, and corporations.

The distribution sites for the questionnaires were JHFHD centers, which are located across the kingdom and divided into three regions: North (including Irbid,

Jerash, Ajloun, and Mafraq), Central (including Amman, Zarqa, Madaba, and Balqa), and South (including Ma'an, Aqaba, Karak, and Tafilah). The Northern region had the highest participation rate of 39.3%, followed by the Central region with 35.4%, and the Southern region with the lowest participation rate of 25.3%. The lower participation rate in the Southern region can be attributed to its vastness and remoteness, which makes it challenging to reach participants due to their constant movement and lack of stability in a specific area.

4 The Results

4.1 Relative Importance of Study Variables

Table 5 presents a concise overview of the significance of the study variables by providing the calculated arithmetic means and standard deviations.

According to the data presented in Table 5, it is evident that the variable of reliability holds the utmost relative significance among the independent variables. This is supported by its high arithmetic mean of 3.71 and a standard deviation of 1.063. These statistical measures clearly indicate that the surveyed sample recognizes the reliability variable as the most crucial aspect of service quality implemented by the Jordan Hashemite Charity Fund.

In contrast, the variable of excellence and precision is deemed to be of lesser significance among the independent variables, as indicated by its arithmetic mean of (3.65) and standard deviation of (1.004). This implies a moderate consensus regarding the fund's dedication to transparency in its provision of services to beneficiaries.

The aforementioned findings suggest that the Jordan Hashemite Charity Fund has established a commendable standing and position within the community, effectively fulfilling its commitments to beneficiaries. As a result, community members

Table 5 Arithmetic means and standard deviations of study sample estimates for independent variables paragraph arithmetic mean standard deviation rank relative importance

Paragraph	Arithmetic mean	Standard deviation	Rank	Relative importance
Transparency	3.63	1.004	5	Moderate
Trust and security	3.70	1.009	2	High
Excellence and precision	3.65	1.009	6	Moderate
Confidentiality and privacy	3.70	1.037	3	High
Reliability	3.71	1.063	1	High
Professionalism	3.68	1.049	4	High
Overall scale	3.68	1.026		High

are inclined to engage with the fund without any reservations. The majority of beneficiaries exhibit a high level of confidence in the fund's ability to provide the necessary services, with reliability emerging as the most influential factor in achieving satisfaction, second only to the trust and security factor.

In terms of importance, the professionalism variable was ranked fourth, signifying the significance of employees' flexibility and respect towards clients. Following this, the transparency variable was ranked fifth, indicating that there may be some lack of clarity in certain procedures for beneficiaries. Lastly, the excellence and precision variable received the lowest rank, highlighting the provision of services in remote areas that are distant from modern technology hubs, which could potentially enhance the delivery of services with a higher level of excellence and precision.

The initial research query is addressed by examining the degree to which the Jordan Hashemite Charity Fund incorporates the various aspects of service quality offered to its beneficiaries. The average score for the dimensions of service quality provided to beneficiaries is 3.68, indicating a high level of significance. This implies that the respondents in the sample concur that the Jordan Hashemite Charity Fund effectively integrates quality dimensions into its services.

4.2 The Main Hypothesis

- The main hypothesis (Ho): There is no statistically significant effect at the ($\alpha \leq 0.05$) significance level of the quality of services provided by JHFHD, in its dimensions, on the satisfaction of its beneficiaries.

Based on the data presented in Table 6, it is clear that the calculated F value (41.92) exceeds the tabulated F value (2.0986), suggesting a statistically significant association between the dependent variable and the independent variables as a whole. The significance level for F is below (0.05). Consequently, we can reject the null hypothesis and accept the alternative hypothesis, signifying a statistically significant impact at the ($\alpha \leq 0.05$) significance level of the quality of services offered by JHFHD on the satisfaction of its beneficiaries.

Moreover, the correlation coefficient of 0.595, which denotes a relatively strong positive relationship, is evident in the table between the dependent variable and the independent variables. Additionally, the independent variables, namely Transparency, Trust and Security, Excellence and Precision, Confidentiality and Privacy, Reliability, and Professionalism, collectively explain 35.4% of the variability in customer satisfaction, as indicated by the coefficient of determination ($R^2 = 0.354$). It is important to note that the remaining percentage of influence on customer satisfaction can be attributed to other factors.

Table 6 Results of multiple linear regression test for the main hypothesis

Dependent variable	Correlation coefficient (R)	Coefficient of determination (R^2)	Calculated F value	Degrees of freedom	Significance level (Sig)	Independent variable	B value
Customer satisfaction	0.595	0.354	41.92	6	0.000	Transparency	0.067
						Trust and security	0.044
						Excellence and precision	0.142
						Confidentiality and privacy	0.054
						Reliability	0.251
						Professionalism	0.234

5 Conclusions

1. The research findings indicate that the Jordanian Hashemite Fund operates based on a defined set of principles and standards in order to deliver services to its beneficiaries. The fund ensures that these standards are effectively communicated to beneficiaries through well-established procedures, supervision, information dissemination, communication channels, and active engagement. As for the level of satisfaction expressed by beneficiaries, it was found to be moderate in regards to the transparency aspect, which is one of the quality dimensions offered by the fund.
2. The study results indicate that the Jordanian fund offered outstanding training services to its beneficiaries, which in turn enhanced their satisfaction with the Fund. Also, the beneficiaries agreed that the service quality dimension of the fund which is trust and security is the main cause of satisfaction among beneficiaries.
3. The results of the study concluded that the Hashemite Fund of Jordan has managed to become among the most important voluntary development institutions. The reasons for this come from the beneficiaries belief that the services provided by this institution is different and better, and this level of satisfaction with excellent and accurate services which is one of the quality dimensions that the Fund bears, was satisfactory among the sample majority.
4. The findings of the research demonstrate that the Jordanian Hashemite Fund consistently upholds the principle of ensuring the confidentiality of information for its beneficiaries. Although the Fund primarily adopts a general public service approach and provides less individual attention in terms of specific privacy services, the majority of beneficiaries expressed satisfaction with the level of confidentiality and privacy measures implemented by the Fund.
5. The results of the study indicate that the Jordanian Hashemite Fund possesses a favorable reputation and standing within the community, which fosters a willingness among individuals to engage with it without any reservations. A majority of the recipients demonstrated their inclination to rely on the Fund in order to access the necessary services, with the element of dependability emerging as the most significant factor in attaining satisfaction.

5.1 Recommendations

1. The study recommends focusing on the transparency dimension, which was moderately satisfied by those sampled and had an 8% impact on beneficiary satisfaction. It is necessary to improve the adopted procedures, ensure equality of all beneficiaries, and clarify control systems and communication channels.
2. The study suggests working to increase the effectiveness of excellence and precision among the Fund's staff and systems. This can be achieved by using advanced, modern systems that reduce the number of errors, ensuring accurate and precise service delivery from the first attempt.

3. Emphasis should be placed on taking into account the trust and security dimension, which has a relative importance of 12.2% for the satisfaction of beneficiaries. That is why it is so important to take into account trust and security and take the necessary actions to ensure information security.
4. The study highlights the need to respect privacy and confidentiality in the provision of services to beneficiaries, offering specific privacy services and taking into account special cases. Although its impact on beneficiary satisfaction is minimal (0.07%) when all dimensions are combined, improving privacy and confidentiality is key.
5. Developing the skills of Jordan Hashemite Fund employees and increasing their problem-solving skills while providing services through continuous training and improvement in order to increase their effectiveness and experience in contacts with beneficiaries.
6. The study suggests developing promotional plans for the organization, its services and the changes it brings to society, conducting continuous field research to measure the response of beneficiaries, and identifying weaknesses in the quality of services to improve them.

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The Reality of Human Resource Management Practices and Their Relationship with Employee Performance in Private Institutions



Jiries Abu Ghannam and Khaled Alzeaideen

Abstract This study aimed to identify the reality of human resource management practices and their relationship with employee performance in private institutions in Bethlehem Governorate. The study was conducted on private institutions in Bethlehem Governorate, and to achieve its objectives, the research team prepared a questionnaire to collect the necessary data from various sources to achieve those goals. The research team adopted the descriptive analytical approach to conduct the study, with the questionnaire as the primary tool for collecting information. The study was conducted on a random sample of 50 questionnaires distributed among the study population, the employees of private sector institutions in Bethlehem Governorate. The study yielded several important results: The results showed that the degree of job design and analysis was significant, with the most common aspects being the existence of job descriptions and specifications prepared by the Human Resources Department, followed by job analysis conducted by the Human Resources Department. The data in the previous table indicate that the degree of recruitment and selection was significant, with the most common aspects being the Human Resources Management determining the characteristics and traits of individuals to be recruited, followed by clear and consistent recruitment and selection policies aligned with the objectives of private sector institutions. The results showed that the degree of training and development was significant, with the most common aspects being private sector institutions providing employees with continuous training opportunities to acquire new skills, followed by private sector institutions assigning employees tasks after completing their training to ensure the application of acquired knowledge in their jobs.

Keywords Human resource management practices · Employee performance · Private institutions · Bethlehem governorate · Human capital theory

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1 Introduction

When we talk about the human element in an institution, we mean one of the most important elements of the institution, and therefore, this element requires the presence of effective management that performs its role correctly for the work to succeed regardless of its nature. Effective management is characterized by its goal-oriented nature. Thus, effective management is a human process aimed at consolidating all human efforts within the institution under one umbrella, investing them wisely by harnessing their potentials, capacities, and creativity to achieve goals with the least effort, time, and cost. This can only be achieved through administrative effort. Thus, effective management is increasingly seen as one of the most important components upon which society relies for progress [1–14].

The institution possesses many resources that it utilizes to improve performance levels and thereby achieve its goals, but the most important and influential resources are human resources, which are considered the primary and essential wealth of the institution and one of the fundamental factors of performance. Human resources enable the institution to survive, continue, and grow within an unstable environment, volatile markets, increasingly complex and diverse products, and the difficulty of satisfying customers and achieving the highest level of productivity and effectiveness. Thus, this policy (performance improvement) is a general policy of the institution, where there is a conviction of the need to activate human resources from senior leadership to executive levels in all areas of activity. Human resources represent all employees in the institution, regardless of their levels, qualifications, and roles [15–24].

There are several reasons that play a significant role in highlighting the importance of human resource management practices as an important means for organizations to gain a competitive advantage, acquire competencies, and develop these competencies. Concepts such as human and intellectual capital have emerged, all of which have led to a changing perception of the value that organizations place on human resource management functions and practices [25–32].

Problem Statement

Employee performance represents the quantity of output per individual employee measured over a specific time unit, reflecting the employee's ability to achieve what is required of them in any job, regardless of its nature. This definition applies to any work, as all jobs require their incumbents to have specific goals, even if these goals vary in size and nature from one job to another. Based on this, the problem statement of the study can be formulated in the following main question: What is the reality of human resource management practices and their relationship with employee performance in private institutions operating in Bethlehem Governorate?

Significance of the Study

The importance of this research lies in the following:

1. Shedding light on the role of human resources, understanding its dimensions, requirements for its application, and its role as one of the most important pillars to maximize the value of the institution to achieve job performance in private sector institutions.
2. The significance of the researched sector: The study focuses on the private sector institutions in Bethlehem Governorate, and demonstrates the impact of human resource management practices on job performance.
3. The study results may benefit private institutions regarding the nature of activities practiced by human resource management.

Study Objectives

The main objective of this study is to achieve the following goal: To identify the reality of human resource management practices and their relationship with employee performance in private institutions.

From the main objective, the following sub-objectives emerge:

1. To elucidate the relationship between human resource practices applied in private institutions in terms of job design and analysis and the performance of employees in these institutions.
2. To clarify the relationship between human resource practices applied in private institutions in terms of recruitment and selection and the performance of employees in these institutions.
3. To explain the relationship between human resource practices applied in private institutions in terms of rewards and the performance of employees in these institutions.
4. To understand the relationship between human resource practices applied in private institutions in terms of internal communication and the performance of employees in these institutions.
5. To determine the level of employee performance in private institutions.

Study Questions

1. What is the relationship between human resource practices applied in private institutions in terms of job design and analysis and the performance of employees in these institutions?
2. What is the relationship between human resource practices applied in private institutions in terms of recruitment and selection and the performance of employees in these institutions?
3. What is the relationship between human resource practices applied in private institutions in terms of rewards and the performance of employees in these institutions?

4. What is the relationship between human resource practices applied in private institutions in terms of internal communication and the performance of employees in these institutions?
5. What is the level of employee performance in private institutions?

Study Hypotheses

1. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the reality of human resource management practices and their relationship with employee performance in private institutions attributable to the gender variable.
2. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the reality of human resource management practices and their relationship with employee performance in private institutions attributable to the educational qualification variable.
3. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the reality of human resource management practices and their relationship with employee performance in private institutions attributable to the job title variable.
4. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the reality of human resource management practices and their relationship with employee performance in private institutions attributable to the years of experience variable.
5. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) regarding the reality of human resource management practices and their relationship with employee performance in private institutions attributable to the monthly income variable.

2 Study Methodology

The research team utilized the descriptive analytical approach, which compares, interprets, and evaluates with the aim of reaching meaningful generalizations about the research topic.

Study Population

This study addressed the topic of the reality of human resource management practices and their relationship with employee performance in private institutions. Therefore, the study population consisted of employees of private sector institutions in Bethlehem Governorate.

Study Sample

The study was conducted on a random sample of 50 questionnaires distributed among the study population, the employees of private sector institutions in Bethlehem Governorate.

Study Instrument

The questionnaire was constructed to obtain the perspectives of the respondents on the study topic.

Study Instrument Reliability

The reliability of the study instrument was verified by examining the internal consistency of the instrument's items by calculating the Cronbach's Alpha coefficient on the total study sample, where the reliability value was (0.95), indicating a very high level of reliability for the instrument.

3 Results

Study Question 1: What is the extent of Human Resource Management practices and their relationship with employee job performance in private institutions in Bethlehem Governorate?

The degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate was significant, with a mean score of 4.12 on the total scale of the study, with a standard deviation of 0.45.

Study Question 2: What are the most important aspects of work design and analysis?

The degree of work design and analysis was significant, with a mean score of 4.16. The most common aspects included job description and job specification prepared by the HR department with an average of 4.34, followed by job analysis conducted by the HR department with an average of 4.34.

Study Question 3: What are the most important aspects of recruitment and selection?

The degree of recruitment and selection was significant, with a mean score of 4.08. The most common aspects included HR management identifying the characteristics of individuals to be recruited with an average of 4.36, followed by clear and goal-aligned recruitment and selection policies with an average of 4.12.

Study Question 4: What are the most important aspects of training and development?

The degree of training and development was significant, with a mean score of 4.02. The most common aspects included private sector institutions providing continuous training opportunities for employees to acquire new skills with an average of 4.16, followed by institutions verifying employees' application of acquired knowledge in their jobs with an average of 4.14.

Study Question 5: What are the most important aspects of rewards?

The degree of rewards was significant, with a mean score of 3.99. The most common aspects included sequential promotions motivating work with an average of 4.14,

followed by private sector institutions offering suitable social and health insurance for employees with an average of 4.10.

Study Question 6: What are the most important aspects of internal communication?

The degree of internal communication was significant, with a mean score of 4.41. The most common aspects included positive internal communications in private institutions aiding employee accomplishment with an average of 4.56, followed by internal communication between departments in private sector institutions aiding in goal achievement with an average of 4.42.

Study Question 7: What are the most important aspects of employee performance?

The degree of employee performance was significant, with a mean score of 4.09. The most common aspects included continuous improvement in employee performance in recent years with an average of 4.34, followed by top management encouraging new ideas and opinions in private sector institutions with an average of 4.16.

Hypotheses

1. There are no statistically significant differences at the $\alpha \leq 0.05$ level in the degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate attributed to gender. Results revealed no statistically significant differences attributed to gender.
2. There are no statistically significant differences at the $\alpha \leq 0.05$ level in the degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate attributed to job title. Results revealed no statistically significant differences attributed to job title.
3. There are no statistically significant differences at the $\alpha \leq 0.05$ level in the degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate attributed to educational qualification. Results revealed no statistically significant differences attributed to educational qualification.
4. There are no statistically significant differences at the $\alpha \leq 0.05$ level in the degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate attributed to monthly income in shekels. Results revealed no statistically significant differences attributed to monthly income.
5. There are no statistically significant differences at the $\alpha \leq 0.05$ level in the degree of HRM practices and their relationship with employee job performance in private institutions in Bethlehem Governorate attributed to years of experience. Results revealed no statistically significant differences attributed to years of experience.

4 Conclusion

In conclusion, the study's findings reveal that private institutions in Bethlehem Governorate exhibit a strong emphasis on sound human resource management practices and their relationship with employee performance. The results indicate that these organizations place significant importance on job design and analysis, with well-defined job descriptions and specifications developed by the HR department. The recruitment and selection processes are also robust, with the HR function clearly defining the desired candidate characteristics and implementing consistent policies aligned with institutional objectives. Furthermore, the data shows private institutions prioritize training and development, providing employees with continuous learning opportunities to acquire new skills, and offering opportunities to apply the acquired knowledge on the job. Collectively, these human resource management practices appear to be contributing positively to enhancing employee performance and organizational effectiveness. Maintaining and further strengthening these HR functions seems crucial for private institutions to sustain a competitive advantage and maximize their workforce productivity. Overall, the study highlights the pivotal role of strategic human resource management in driving superior employee and organizational outcomes.

5 Recommendations

Based on the aforementioned results, the following recommendations can be summarized:

- Enhance recruitment, hiring, and testing processes to align with job requirements and uplift individual and institutional performance.
- Conduct training courses for HR personnel to clarify HRM concepts and modern principles in job analysis, recruitment, selection, and evaluation.
- Focus on performance evaluation processes within the organization and develop evaluation models covering all aspects.
- Review wage, incentive, and monetary reward policies.
- Develop an HR training program based on organizational needs.

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The Impact of Direct Marketing Tools on Purchasing Decision of Service (A Field Study of a Telecommunications Company's Customers)



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Abstract The study you've outlined appears to focus on examining the influence of various direct marketing tools on consumer purchasing decisions, specifically within the context of Umniah Telecommunications customers. It's interesting to see how the study encompasses a range of direct marketing channels, including email, direct selling, telemarketing, and social media marketing, as independent variables, with consumer purchasing decisions as the dependent variable. Utilizing Google Forms for data collection seems like a practical choice, given its accessibility and ease of use. Additionally, employing statistical analysis through AMOS helps ensure the validity and reliability of the findings, which is crucial for drawing meaningful conclusions. The results indicating a statistically significant impact of each direct marketing tool on consumer purchasing decisions suggest that Umniah Telecommunications can potentially optimize its marketing strategies by focusing on these channels. The recommendations provided—such as enhancing email marketing efforts, refining direct selling strategies, improving telemarketing approaches, and leveraging social media marketing—seem tailored to capitalize on the identified influences and strengthen the company's marketing capabilities. Overall, the study seems to offer valuable insights for Umniah Telecommunications or similar companies looking to refine their direct marketing strategies to better align with consumer preferences and behaviors.

Keywords Direct marketing tools · Email marketing · Social media marketing · Telemarketing · Purchasing decision

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1 Introduction

Marketing has shifted towards digital technology, emphasizing personalized approaches like direct marketing using tools such as E-mail, direct mail, telemarketing, and social media [1]. Companies strive to reach broad customer bases through traditional and modern marketing tools to achieve goals like providing unique products/services, maximizing revenue, and fostering loyalty.

Consumer buying decisions are influenced by various factors like demographics, psychology, and culture. In sectors like telecommunications, diverse marketing strategies are essential for competitiveness and goal achievement [2].

Marketers in telecom companies focus on acquiring and retaining customers, ensuring satisfaction and loyalty, and driving sales. Direct marketing facilitates direct communication with customers, addressing their needs effectively.

1.1 Research Problem and Questions

Due to fierce competition between telecommunication companies in Jordan in achieving goals which are attracting more customers, direct marketing is an important aspect of marketing. It has several tools such as E-mail marketing, direct mail, telemarketing, and social media marketing. Each one of these mentioned tools has its impact on customers' decisions. The issue of this study is focusing on is discovering which tool has the most impact on customers' decisions. The research questions are as follows:

What is the impact of direct marketing tools on purchasing decision of service?

1.2 Research Objectives

This research aims to assess the impact of direct marketing tools on the purchasing decision of Umniah telecommunication mobile services.

1.3 Research Hypotheses

- H0: There is no impact of direct marketing tools on Umniah company consumer's buying behavior which leads to the following sub-Hypotheses:
- H1: There is no significant impact of email as a direct marketing tool on Umniah company consumer's buying behavior.
- H2: There is no significant impact of direct selling as a direct marketing tool on Umniah company consumer's buying behavior.

- H3: There is no significant impact of telemarketing as a direct marketing tool on Umniah company consumer's buying behavior.
- H4: There is no significant impact of social media marketing as a direct marketing tool on Umniah company consumer's buying behavior.

2 Literature Review

A corroding to [3] study showed that direct marketing has a direct impact on buying behavior on the other hand conventional marketing has indirect marketing on customers buying behavior, The study by [1]. showed that marketing strategy encourages the purchasing decision, The study by [4] The study has concluded that there is an impact of all three types of digital marketing on purchasing behavior, but separately there is an important role of both types of digital marketing (mobile marketing, social media marketing) in encouraging people to purchase via digital stores. The study by [5] concluded that there is a major effect of digital marketing including mobile marketing, and social media marketing on consumer purchasing behavior. The study carried out by [6] showed that there is a strong relationship between direct marketing and consumer buying behavior, and that direct marketing is the most effective tool of communication to enhance the maximum selling of a brand.

3 Research Methodology

The methodology reflects the theoretical and applied approach of the researcher in dealing with the research problem and allows the reader to evaluate the validity of the results and their generalizability. The study adopted descriptive-analytical and survey methodologies.

3.1 The Population

In the current study, Umniah Telecommunications Company's customers in Zarqa city were targeted, and the researcher was unable to precisely determine the population size due to its vastness and the large number of the company customers.

Table 1 Reliability of the questionnaire (Cronbach's alpha)

Statements	Variables	Dimensions	Number of statements	Cronbach's alpha coefficient
5	Direct marketing tools	E-mail	Q1–Q5	0.914
4		Direct selling	Q6–Q9	0.860
6		Telemarketing	Q10–Q15	0.899
5		Social media marketing	Q16–Q20	0.913
8	Purchasing decision		Q21–Q28	0.859
28	All items		Q1–Q28	0.953

3.2 Sample Size

Given the uncertainty about the actual size of the study population, the researcher opted for the largest representative sample size from Sekaran's table, which indicated a minimum of 384 respondents. Employing a suitable sampling method, the researcher utilized Google Forms to design and distribute electronic surveys, ensuring efficient and extensive reach to the target population with minimal time and effort.

To ensure accuracy, 500 questionnaires were distributed. Of these, 105 were not returned, constituting 21% of the total distributed. However, 79% of the questionnaires were returned and deemed valid for analysis. As a result, the sample size comprised 395 respondents.

This measure is crucial in the development and evaluation of questionnaires, surveys, or any assessment tool involving multiple items aimed at gauging a particular psychological trait, attitude, knowledge area, or other specified construct. In fields such as psychology, education, and social sciences, where ensuring the reliability of measurement instruments is vital for the validity of research conclusions, Cronbach's alpha serves as a valuable indicator of internal consistency.

From Table 1, we can see that all the study variables' Cronbach's alpha values are more than (0.7). The highest "Cronbach's" Alpha value is (0.914) belongs to the "E-mail" dimension, while the lowest (0.859) belongs to the "Purchasing Decision" variable. All items "Cronbach's" Alpha coefficient is (0.953).

From Table 1, we can note that none of the bivariate relationships was above (0.8) for the independent variable, so we can conclude that multicollinearity doesn't exist (Table 2).

3.3 Normality Test

A normality test is a statistical technique used to determine if data from a sample or population follow a normal distribution. Several approaches can be used for this goal, but the Kolmogorov–Smirnov test is one of the most common. This test compares

Table 2 Correlations matrix of independent dimensions

Independent variables	E-mail	Direct selling	Telemarketing	Social media marketing
E-mail	1	0.503**	0.435**	0.447**
Direct selling		1	0.732**	0.669**
Telemarketing			1	0.719**
Social media marketing				1

**Correlation is significant at the 0.01 level

Table 3 The normality of the study variables

Variables	(K-S) coefficients	*P*-value
E-mail	3.510	0.151
Direct selling	2.994	0.216
Telemarketing	1.923	0.187
Social media marketing	2.969	0.235
Purchasing decision	3.447	0.140

the distribution of a sample or population to the standard normal distribution and determines whether the data deviates considerably from the normal pattern. The p-value (≥ 0.05) and Kolmogorov–Smirnov coefficients (less than 5) indicate whether the data follows a normal distribution or not.

Table 3 showed the *P*-value of the variables, which are greater than (0.05) and this proves that the variables do belong to the normal distribution.

4 Data Analysis and Hypotheses Testing

4.1 Description of Variables

To evaluate the level of direct marketing tools and the purchasing decision, the survey responses were analysed through the calculation of means and standard deviations. The responses were then categorized according to the significance of each item, providing an overview of the condition of the variables under study. This process involves examining and analysing the statements of each dimension of the research, followed by determining the aggregate average for each variable separately.

Level of Direct Marketing Tools

The Direct Marketing variable is composed of four dimensions. The following explains the dimensions' level of importance.

- **First Dimension: E-mail**

The (dimension was measured by five statements, Table 4 shows the, Mean value), and, Standard Deviation), for the respondents' answers towards this dimension.

From Table 4, we observe that E-mail statements are within a medium level of importance; the highest (mean is (3.29) with (1.290) (standard deviation belonging to (statement number four "**Umniah Telecommunication company uses e-mail marketing campaigns effectively to reach the target audience**", it belongs to medium level of importance. The (lowest mean is (3.14) with (1.307) standard deviation) This belongs to a statement one, "**Umniah Telecommunication Company communicates with customers via e-mail permanently**", it is classified within a medium level too. The E-mail dimension scores a medium-level mean average (3.34), which indicates according to the respondents' opinions that the Umniah Telecom utilizes email as one of the means of direct marketing at a moderate level.

- **Second Dimension: Direct selling**

Direct selling was measured by four statements), Table 5 shows the, (Mean value), and, Standard Deviation), for the respondents' answers towards this dimension.

Table 5 shows the Direct selling arithmetic mean) located between (3.46–3.82), and they are classified within (high and medium) level. The ninth statement "**Umniah Telecommunication company uses a direct selling method to clarify customer's way of use**" scored (3.82), it is classified within the high level) and standard deviation (1.062). The lowest (mean belongs to the sixth statement "**The sales representatives**

Table 4 Mean and standard deviation of e-mail dimension

Items	Mean	Standard deviation	Importance	Level
1. Umniah Telecommunication Company communicates with customers via e-mail permanently	3.14	1.307	Medium	5
2. Umniah Telecommunication company provides customers with its promotional offers via e-mail	3.24	1.295	Medium	4
3. Umniah Telecommunication company provide customer with new updates including new features via e-mail	3.26	1.287	Medium	2
4. Umniah Telecommunication company uses e-mail marketing campaigns effectively to reach the target audience	3.29	1.290	Medium	1
5. Umniah Telecommunication company answers customer's questions	3.25	1.200	Medium	3
E-mail	3.34		Medium	

Table 5 Mean and standard deviation of direct selling dimension

Items	Mean	Standard deviation	Importance	Level
6. The sales representatives have enough information about Umniah company and its service	3.46	1.142	Medium	4
7. Umniah Telecommunication company uses direct selling to provide specific information that customers are seeking	3.79	1.078	High	2
8. Umniah Telecommunication company uses direct selling as an effective communication method with customers	3.54	1.104	Medium	3
9. Umniah Telecommunication company uses a direct selling method to clarify customer's way of use	3.82	1.062	High	1
Direct selling	3.65		Medium	

have enough information about Umniah company and its service". It scored) (3.46) and is classified within (medium level, and standard deviation (1.142). The Direct selling dimension scored a medium level with an arithmetic mean (3.65), which indicates according to the respondents' opinions that Umniah Telecom utilizes direct selling as one of the means of direct marketing at a moderate level.

- **Third Dimension: Telemarketing**

The (dimension was measured by six statements), Table 8 shows the, (Mean value), and, Standard Deviation) for the respondents' answers towards this dimension.

Table 6 clarifies that Telemarketing (statements are within the (high and medium levels and statement number eleven "**Umniah Telecommunication company uses SMS messages to grab customer's attention towards a promotional offer**" scored the highest mean (4.11). It is classified within the high level, and the (standard deviation is (0.983). On the other hand, the lowest mean belongs to the statement fourteen "**Telemarketing helps meet the customer's needs in the shortest time**". It scored an arithmetic mean and (3.48) classified within the medium level and the standard deviation is (1.079). As the Telemarketing dimension) scored (3.78), it is classified within the high level which indicates according to the respondents' opinions that the Umniah Telecom utilizes Telemarketing as one of the means of direct marketing at a high level.

Fourth Dimension: Social Media Marketing

The (dimension was measured by five statements), Table 7 shows the, (Mean value), and, Standard Deviation), for the respondents' answers towards this dimension.

From Table 7, it's evident that the Social Media Marketing dimension is perceived as highly important by respondents. The statement with the highest mean (3.99) and

Table 6 Mean and standard deviation of telemarketing dimension

Items	Mean	Standard deviation	Importance	Level
10. Umniah telecommunication service providers give enough information about a service	3.93	1.038	High	3
11. Umniah Telecommunication company uses SMS messages to grab customer's attention towards a promotional offer	4.11	0.983	High	1
12. Umniah Telecommunication company uses telephone marketing that provides all the information customer's request	3.58	1.093	Medium	5
13. The company uses telemarketing to display its products or services	3.62	1.028	Medium	4
14. Telemarketing helps meet the customer's needs in the shortest time	3.48	1.079	Medium	6
15. The ease of using the phone helps me to continually communicate with the company	3.96	1.073	High	2
Telemarketing	3.78		High	

Table 7 Mean and standard deviation of social media marketing dimension

Items	Mean	Standard deviation	Importance	Level
16. Social media marketing contributes to increasing awareness of the company's services	3.96	1.012	High	2
17. Social media marketing activities are effective in engaging with customers who are interested in the company's telecommunication services	3.94	1.002	High	3
18. Social media platforms assist the company in sharing information about telecommunication services	3.91	0.994	Medium	4
19. Social media marketing efforts contribute positively to customer retention for the company	3.82	1.078	High	5
20. Social media marketing contributes to establishing a positive image for the company and its services	3.99	1.034	High	1
Social media marketing	3.92		High	

Table 8 Mean and standard deviation of direct marketing dimensions

Items	Mean	Level	Importance
1. E-mail	3.34	Medium	4
2. Direct selling	3.65	Medium	3
3. Telemarketing	3.78	High	2
4. Social media marketing	3.92	High	1
Direct Marketing	3.67	High	

a standard deviation of (1.034) is statement number twenty: "Social media marketing contributes to establishing a positive image for the company and its services," indicating a high level of importance. Conversely, the statement with the lowest mean (3.82) and a standard deviation of (1.078) is statement nineteen: "Social media marketing efforts contribute positively to customer retention for the company," also classified within the high level of importance. Overall, the Social Media Marketing dimension achieves a high-level mean average of (3.92), suggesting that respondents perceive Umniah company as highly utilizing social media marketing as a means of direct marketing.

To ascertain the level of Direct Marketing at Umniah company, the mean was calculated across the independent variable dimensions. Table 8 presents the results.

The results show that Social Media Marketing dimension had the highest mean of Direct Marketing tools, with a mean (3.92) and it was classified within a high level, which means it represents the most using by Umniah Company. On the other hand, the E-mail dimension scored the lowest mean (3.34) and it was classified within a medium level. The result showed that Direct Marketing scored a high mean level (3.67) and it is classified within a high level.

(Level of Purchasing Decision (Dependent Variables)

The (Purchasing Decision variable was measured by eight statements), Table 9 shows the, (Mean value), and, Standard Deviation), for the respondents' answers towards this dimension.

Table 9 shows the Purchasing Decision (arithmetic mean) located between (3.36–4.03), and they are classified within (high and medium) levels. The statement twenty-four "**The ratio of sales increases when the company uses advanced marketing methods**" scored (4.03), and is classified as the highest mean,) and standard deviation scored (1.002). The lowest (mean belongs to the statement twenty-five "**Umniah Telecommunication e-mail services encourages me to purchase**". It scored) (3.36) and it is classified within (medium level, and standard deviation (1.233). The Purchasing Decision variable scored high level with an arithmetic mean (3.79).

Table 9 Mean and standard deviation of purchasing decision variable

Items	Mean	Standard deviation	Importance	Level
21. Customers purchasing decisions are influenced by direct marketing tools	4.00	0.972	High	2
22. Direct selling convinces me to purchase the service	3.48	1.049	Medium	7
23. Direct Marketing activities provide all the information requested to make a purchase decision	3.97	0.941	High	3
24. The ratio of sales increases when the company uses advanced marketing methods	4.03	1.002	High	1
25. Umniah Telecommunication e-mail services encourages me to purchase	3.36	1.233	Medium	8
26. Resolving issues by Umniah company encourages customer to deal with them later	3.88	1.116	High	5
27. I recommend my friends, family, or colleagues to purchase Umniah telecommunication services	3.70	1.169	High	6
28. The effectiveness and skills of sales representatives working in Umniah affect purchasing behavior	3.93	1.097	High	4
Purchasing Decision	3.79		High	

4.2 Test of the Hypotheses

The study comprises five hypotheses, where one main Hypotheses, and the remaining four function as sub hypotheses. To evaluate the impact of the independent variable on the dependent variable, the research employed structure equation modeling to test the hypotheses. Figure 1 shows the results of the hypotheses.

4.3 The Main Hypotheses Analysis

H0: There is no statistically significant impact at ($\alpha \leq 0.05$) of direct marketing tools on purchasing behavior in Umniah Company's Telecommunication Consumer's.

The value of r indicates the correlational relationship between the dimensions of the independent variable (email, direct selling, telemarketing, and social media marketing) and the dependent variable (purchasing behavior). Table 10 indicates

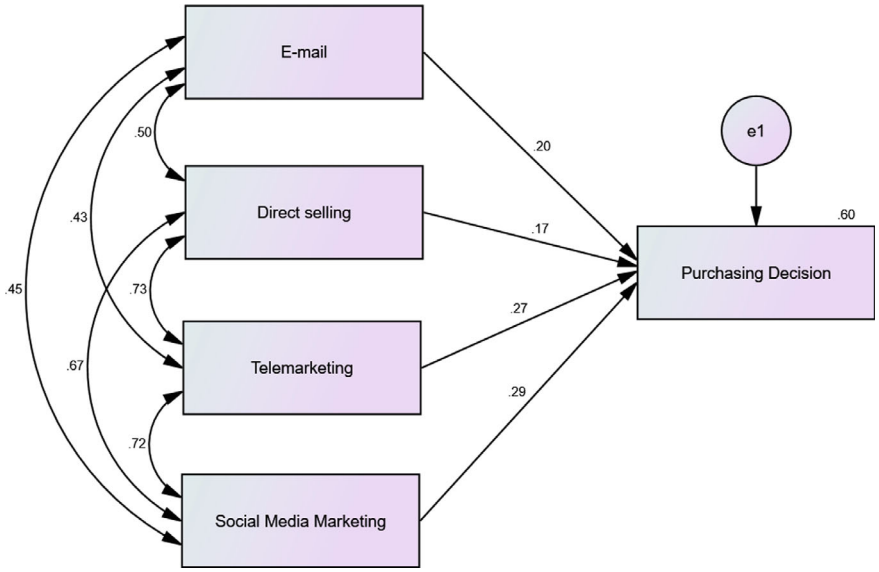


Fig. 1 The structure equation modelling of the hypotheses

the presence of a strong positive inverse relationship between the dimensions of the independent variable and the dependent variable, with a value of $r = 0.776$.

The coefficient of determination ($r^2 = 0.603$) indicates that the direct marketing dimensions collectively account for approximately 60.3% of purchasing behavior, while the remaining percentage is attributed to other factors.

Comparing the tabular F-value (2.61) with degrees of freedom (4/394) to the calculated F-value for the ANOVA test (148.002), the calculated value exceeds the tabular value, confirming the significance of the regression model. With a P-value of (0.000) below the significance level of (0.05), the null hypothesis is rejected, indicating a statistically significant impact ($\alpha \leq 0.05$) of direct marketing tools on purchasing behavior among Umniah company's Telecommunication consumers.

4.4 Test of the First Sub Hypotheses

H01: There is no statistically significant impact at ($\alpha \leq 0.05$) of email as a direct marketing tool on purchasing behavior in Umniah Company's Telecommunication Consumer's.

Table 11 shows the result of the first sub-Hypotheses.

The correlational relationship between the independent variable dimension, E-mail, and the dependent variable, purchasing behavior, is weak positive and non-significant ($r = 0.204$), as indicated in Table 14. The coefficient of determination

Table 10 The main hypotheses analysis result

Regression weight		standardized coefficients	Unstandardized coefficients	Independent variable Dimension	ANOVA			Model summary	
P-value	C.R.	Estimate (beta)	Estimate (B)		*P*-value	D.F.	F	r^2	r
0.000	5.456	0.204	0.139	E-mail	0.000	4	148.02	0.603	0.776
0.000	3.331	0.168	0.191	Direct selling		390			
0.000	5.205	0.272	0.243	Telemarketing		394			
0.000	5.900	0.285	0.247	Social Media Marketing					

Table 11 Result of first sub-hypotheses

Independent variable	Model summary		Unstandardized coefficients	Regression weight	
	r (Beta)	r^2	B	C.R.	*P*-value
E-mail	0.204	0.042	0.139	5.456	0.000

Table 12 Result of the second sub-hypotheses

Independent variable	Model summary		Unstandardized coefficients	Regression weight	
	r (Beta)	r^2	B	C.R.	*P*-value
Direct selling	0.168	0.028	0.191	3.331	0.000

($r^2 = 0.042$) suggests that the E-mail dimension contributes approximately 4.2% to purchasing behavior, with the remaining percentage attributed to other factors.

Upon comparison with the tabular C.R. (1.986), the calculated C.R. for the Regression Weight test (5.456) exceeds the tabular value, confirming the significance of the regression model. With a P-value of (0.000) below the significance level of (0.05), the null hypothesis is rejected, indicating a statistically significant impact ($\alpha \leq 0.05$) of email as a direct marketing tool on purchasing behavior among Umniah company's Telecommunication consumers.

Furthermore, the B value for the test is (0.139), indicating that a one-unit change in the E-mail variable positively impacts purchasing behavior by 0.139 units.

4.5 Test of the Second Sub Hypotheses

H02: There is no statistically significant impact at ($\alpha \leq 0.05$) of direct selling as a direct marketing tool on purchasing behavior in Umniah company consumer's

- **There is statistically significant impact at ($\alpha \leq 0.05$) of Direct selling as a direct marketing tool on purchasing behaviour in Umniah company consumers**.
- The results showed that the B value for the test was (0.191), indicating that if there is a one-unit change in the variable of Direct selling, it will positively impact the variable of purchasing behavior by an amount of (0.191).

4.6 Test of the Third Sub Hypotheses

H03: There is no statistically significant impact at ($\alpha \leq 0.05$) of telemarketing as a direct marketing tool on purchasing behavior on Umniah Company Consumer's

Table 13 Result of the third sub-hypotheses

Independent variable	Model summary		Unstandardized coefficients	Regression weight	
	r (Beta)	r^2	B	C.R.	*P*-value
Telemarketing	0.272	0.059	0.243	5.205	0.000

Table 14 Result of the fourth sub-hypotheses

Independent variable	Model summary		Unstandardized coefficients	Regression weight	
	r (Beta)	r^2	B	C.R.	*P*-value
Social media marketing	0.285	0.081	0.247	5.900	0.000

The correlational relationship between the independent variable dimension, Telemarketing, and the dependent variable, purchasing behavior, is weak positive and non-significant ($r = 0.272$), as indicated in Table 13. The coefficient of determination ($r^2 = 0.059$) suggests that the Telemarketing dimension contributes approximately 5.9% to purchasing behavior, with the remaining percentage attributed to other factors.

Upon comparison with the tabular C.R. (1.986), the calculated C.R. for the Regression Weight test (5.205) exceeds the tabular value, confirming the significance of the regression model. With a P-value of (0.000) below the significance level of (0.05), the null hypothesis is rejected, indicating a statistically significant impact ($\alpha \leq 0.05$) of Telemarketing as a direct marketing tool on purchasing behavior among Umniah company consumers.

Furthermore, the B value for the test is (0.243), indicating that a one-unit change in the Telemarketing variable positively impacts purchasing behavior by 0.243 units.

4.7 Test of the Fourth Sub Hypotheses

H04: There is no statistically significant impact at ($\alpha \leq 0.05$) of social media marketing as a direct marketing tool on purchasing behavior on Umniah Company Consumer's

As per Table 14, the findings indicate a weak positive and non-significant relationship ($r = 0.285$) between the independent variable dimension, social media marketing, and the dependent variable, purchasing behavior. The coefficient of determination ($r^2 = 0.081$) reveals that the social media marketing dimension contributes approximately 8.1% to purchasing behavior, with the remaining percentage attributed to other factors. This contribution represents the highest among the dimensions of the independent variable.

The calculated C.R. for the Regression Weight test (5.900) exceeds the tabular C.R. (1.986), confirming the significance of the regression model. With a P-value of (0.000) below the significance level of (0.05), the null hypothesis is rejected, indicating a statistically significant impact ($\alpha \leq 0.05$) of social media marketing as a direct marketing tool on purchasing behavior among Umniah company consumers.

Furthermore, the B value for the test is (0.247), signifying that a one-unit change in the variable of social media marketing positively impacts purchasing behavior by 0.247 units.

5 Discussion of Findings and Recommendations

5.1 Discussion of Findings

1. Is there any impact of the direct marketing tool on the purchasing behavior of Umniah telecommunication mobile service?

The findings suggest a statistically significant impact of direct marketing tools, including email, direct selling, telemarketing, and social media marketing, on purchasing behavior. Moreover, there exists a positive relationship between these dimensions of direct marketing and purchasing behavior. Enhancing the level of direct marketing within Umniah could thus positively influence purchasing behavior, with these dimensions accounting for 60.3% of the variance in purchasing behavior. These results are consistent with Ningsih et al. [7], who found a positive and significant relationship between direct marketing and purchase intention, as well as between direct marketing and purchase decisions. Similarly, Kewat et al. [3] observed a direct impact of direct marketing on buying behavior, contrasting with the indirect impact of conventional marketing. This aligns with the conclusions of [8], who determined that email marketing, mobile marketing, and social media marketing positively affect consumer buying decisions in the Egyptian market's modern trade sector. Furthermore, Mlobothi [9] demonstrated that telemarketing, magazine advertisements, and television home marketing significantly influence purchasing decisions in the cosmetics industry in Mathatha.

2. Is there any impact of the E-mail tool on the purchasing behavior of Umniah telecommunication mobile service?

Email, as a direct marketing tool, significantly contributes to purchasing behavior. The analysis reveals a statistically significant impact of email on purchasing behavior, with a calculated coefficient of 5.456, indicating a measurable influence between the variables. Although the relationship between email and purchasing behavior is described as weakly positive, it remains statistically significant. Specifically, the email dimension can explain 4.2% of purchasing behavior, with the remaining percentage attributed to other factors. Moreover, an increase of one unit in email

activity correlates with a 0.139 increase in purchasing behavior, underscoring the direct relationship between email engagements and purchasing decisions. These findings align with study, which emphasized the significant effect of digital channels, including email, on consumer buying decisions. Similarly, [10] demonstrated that email marketing positively affects customer profitability and the likelihood of repurchasing orders among online consumers.

3. Is there any impact of the Direct selling tool on the purchasing behavior of Umniah telecommunication mobile service?

The analysis underscores the significant role of direct selling in influencing purchasing behavior from the customer's perspective, with a statistically significant impact evidenced by a C.R. value of 3.331. This suggests a substantial influence of direct selling on purchasing behavior, with an observed inverse relationship, indicating that enhancements in direct selling positively impact purchasing behavior.

Although the direct selling dimension contributes the lowest proportion, accounting for 2.8% of purchasing behavior, it remains noteworthy. Additionally, an increase of one unit in direct selling activity corresponds to a 0.168 increase in purchasing behavior, underscoring the direct relationship between these variables.

These findings are congruent with the conclusions drawn from Mulyadi [11] study, which emphasized the influential role of advertising and personal selling on consumer purchasing decisions.

4. Is there any impact of the Telemarketing tool on the purchasing behavior of Umniah telecommunication mobile service?

Telemarketing significantly contributes to enhancing purchasing behavior from the customers' perspective. The analysis demonstrates that the telemarketing dimension has a statistically significant impact on purchasing behavior, with a C.R. value of 5.205 indicating a considerable influence. Additionally, the relationship between these variables is characterized as inverse, implying that an improvement in telemarketing positively affects purchasing behavior. Specifically, the telemarketing dimension can account for 5.9% of purchasing behavior, with the remaining percentages attributed to other factors. Moreover, an increase of one unit in telemarketing activity results in a 0.243 increase in purchasing behavior, confirming the direct relationship between these variables.

5. Is there any impact of the social media marketing tool on the purchasing behavior of Umniah telecommunication mobile service?

The analysis demonstrates that social media marketing plays a crucial role in shaping purchasing behavior, as indicated by a statistically significant impact with a C.R. value of 5.900. This suggests a substantial influence of social media marketing on purchasing behavior, with a noted inverse relationship, implying that enhancements in social media marketing positively affect purchasing behavior.

Specifically, the social media marketing dimension accounts for 8.1% of purchasing behavior variance, representing the highest contribution among the independent variable dimensions. Furthermore, a unit increase in social media marketing

activity correlates with a 0.247 increase in purchasing behavior, affirming a direct relationship between these variables.

[3–5] These findings are consistent with prior researches which underscored the influential role of social media marketing in purchasing decisions. They also align with the conclusions of, emphasizing the significant impact of digital channels, including social media, on consumer buying decisions. Similarly, [5] study concluded that digital marketing, encompassing social media marketing, exerts a substantial effect on consumer purchasing behavior [9].

6. What is the level of Direct Marketing for Umniah Company?

The results indicate that Umniah Company exhibits a high level of direct marketing, with an arithmetic mean of 3.67. This suggests a strong emphasis on the independent variable dimensions. Among the direct marketing tools, social media marketing stands out with the highest arithmetic mean (3.92). It plays a significant role in enhancing the company's image, increasing awareness of its services, and fostering positive perceptions among consumers. Telemarketing also holds considerable importance, ranking second with a high arithmetic mean. However, it falls short in providing comprehensive information and meeting customer needs promptly, especially compared to SMS messages. E-mail marketing receives the lowest mean score (3.34) as the company's communication via email is inconsistent, and promotional offers are not consistently conveyed through this channel. Direct selling ranks at a medium level of importance, with an arithmetic mean of 3.65. This is attributed to insufficient information provided by sales representatives about Umniah company and its services, as well as a lack of emphasis on clarifying customer needs through direct selling methods.

7. What is the level of Purchasing Decision in the Umniah Company Customers?

The results show that the level of Purchasing Decision is high with arithmetic mean (3.79) because the ratio of sales increases when the company uses advanced marketing methods, and Customers purchasing decisions are influenced by direct marketing tools.

6 Recommendations

1. Enhancing Email Marketing Efforts

Umniah should focus on personalizing its email content to better meet the needs and interests of different customer segments.

Using analytics to understand what types of email content drive the most engagement and sales, and adjust strategies accordingly.

2. Optimizing Direct Selling Strategy

Ensuring that sales representatives are well-informed and trained. This could include product knowledge, understanding customer needs, and effective communication techniques.

Enhancing the direct selling experience by incorporating feedback mechanisms and personalized selling approaches to meet individual customer preferences and needs.

3. Improving Telemarketing Approaches

Focusing on making telemarketing calls more customer-centric, with an emphasis on understanding and addressing customer needs rather than just selling.

Implementing a feedback loop to continuously improve call strategies based on customer responses and preferences.

4. Leveraging Social Media Marketing

Including a mix of promotional, informational, and interactive content.

Partnering with influencers to expand reach and credibility within target markets, leveraging the high impact of social media marketing on purchasing behavior.

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Technological Enhancements in the Criminal Protection of Patents

Lubna Ahmed Kreishan

Abstract Criminal protection for patents is important because it protects the rights of inventors and promotes innovation, investment in science and technology. Therefore, it supports the inventor and provides protection against piracy. This study looks at the developments and current challenges related to criminal protection of patents through technology. It also attempts to identify patent offenses and penalties under national law and international conventions. Additionally, it will identify the role of government departments and institutions in patent protection and identify current barriers as well as patterns and trends in patent protection. The conclusion will identify some feasible strategies to strengthen patent protection against crime and is expected to promote the development of this important sector.

Keywords Patents · Protection · Penalties · Patent certificate · Technology enhancement

1 Introduction

Criminal protection of patents is a paramount issue for the promotion and respect of inventors' rights. This also facilitates innovation and investment in science and technology fields. Furthermore, patents serve as essential tools in boosting economic growth and developing the economy of the state since they motivate research work and give adequate protection to local scientists' products as well as their inventions. Thus, an examination of this topic is needed to improve people's understanding of criminal protection of patents.

Another point that should not be neglected is the role of international criminal protection of patents as an important issue in the realm of public international law to

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ensure justice for inventors and help to enhance research activities so as to develop and utilize innovation and technology. In this respect, the pursuit of criminal protection involves creating legislation that clearly sets out the legal boundaries within which crimes and punishments associated with patent infringement can take place, as well as developing comprehensive legal frameworks for their safeguarding. Such provisions must also anticipate future challenges and developments.

2 The Nature of Criminal Protection for a Patent

The patent is the official document issued by an appropriate governmental body, which shows that a person has created something new and useful, following all necessary procedures. This document gives the inventor all the rights to enjoy the benefits of his or her invention for a fixed term determined by law. The main importance of acquiring the patent is in the opportunity to use criminal protection and prevent third parties from infringement by any means [1].

Regarding a new invention, it doesn't matter what its scale, area of work, industry processes, or manufactured products are because the patent is approved for any useful improvements for humanity. Moreover, it is a testament to an inventor's right to safeguard their novel and inventive creation and is deemed one of the vital forms of intellectual property protection.

A patent is issued to the inventor as recognition of their labor in discovering or enhancing technology. The principle behind a patent is that an inventor is given exclusive rights to enjoy the benefits of their innovation while others are prevented from using, manufacturing, or selling it without authorization. This way, it fosters creativity and ingenuity in society and at the same time safeguards the return on intellectual capital invested by individuals [2].

The criminal protection of patents is highly significant in its contribution to ensuring the just and proper reward for inventors as well as to foster their innovations and safeguard them from illegal use or violations. In this regard, criminal protection builds upon the integrity of the intellectual property system; which plays a significant role in the ongoing development of science and technology through stimulating innovation and promoting market-driven healthy competition. Therefore, focusing on protecting patent deterrence is an important step towards achieving sustainable development.

They offer different types of patents: scientific patent, Industrial Street, agricultural and plant patent. This depends on the field in which the invention takes place, there are different patents, for example, a scientific patent is different from all inventions coming from medicine, chemistry and biology, and engineering and technology patents cover inventions coming from the two earlier fields. Agriculture and plants look for inventions from agriculture, breeding and plant development. The main reason for this different invention is to protect intellectual property, promote creativity, as well as advance technology in domestic industries and areas.

2.1 The Legal Framework for the Criminal Protection

It is established that there are international conventions and laws developed by countries to protect inventors' property rights and promote inventors' innovations. For example, the Cooperative Patents Treaty, the International Trade Agreement on the Legislation of Intellectual Property and the Protection of Patent Continuity, as well as several international laws designed to strengthen the criminal legal protection of patents from different countries.

Patent criminal protection legislation is the laws and regulations governing intellectual property rights in the country. Pursuant to Art. 2 of the Jordanian Patent Law, which regulates the protection of patents and the procedures to be followed when applying for a patent. Also other acts on the protection of intellectual property and regulations on innovation and scientific research in the country. These laws were established to provide the basis for a legal framework to protect patents and encourage innovation around the world.

National laws are specifically designed for each country regarding the enforcement of criminal sanctions under patent protection. There are several significant differences in national law, especially in the general overview of preventive measures, which forms the primary private property legal basis for patent protection in the country. These include rules on patent registration, several protocols for the investigation of patent offenses and legal proceedings for copyright infringement as examples of these national rules.

Agreements of this type are of great importance for the development of international cooperation in the field of protection of patent rights—instruments conducive to closer cooperation in the enforcement of intellectual property rights—as well as formalizing legal concepts and norms and ensuring the possibility of exchanging information and mutual action in combating anti-patent crimes in individual countries. One such instrument is the Paris Convention for the Protection of Industrial Property; another example is the World Intellectual Property Organization (WIPO) Treaty.

Copyright as an intangible property right is central to evolving legislative issues in Jordan. It remains bound by several treaties relating to intangible property rights, such as intellectual property rights. Among these treaties are; The Patent Cooperation Treaty (PCT), which entered into force on January 12, 1978, joined in 1980. In this treaty, it is agreed to abide by international standards to protect patents from its jurisdiction and the rights of inventors.

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) has been also joined. This treaty requires Jordan to protect the rights of inventors internationally and makes it an attractive place for innovation and trade. These treaties contribute to promoting a moral climate of cooperation on innovation and intellectual property rights [3].

International criminalization of patent crimes is necessary. It calls for the development of an international cooperation strategy to address patent crimes where these crimes cross national borders. International cooperation may be done in many ways,

like exchanging information and expertise and working together during legal procedures, thus ensuring efficient integration of efforts leading to increased capacity against patent infringement crimes on a global scale.

The value of international agreements is stressed through putting focus on information sharing and cooperation for law enforcement in crimes involving copyright infringement. The establishment of these agreements aims at creating mechanisms that would ease the exchange of information among contracting states, which should relate to the crimes concerned with patents as well as evidence of such crimes. Through the cross-border exchange of information and cooperation, responsible bodies can gather adequate data to conduct investigations into criminal offenses and bring justice to victims.

International criminal protection of patents is achieved through cooperation among national judicial authorities. The cooperation to be explored here goes beyond the mere use of appropriate tools and methods of patent crime, and the mutual exchange of information and knowledge for this purpose. Judicial cooperation ensures that the parties can act in harmony; whether appropriate means and methods are used; and that one court provides investigative and adjudicative support to the other.

Protecting international patents through the framework provided by international agencies is crucial. The international organization acts as a nodal driver for member countries, enabling them to coordinate their efforts and disseminate relevant information on combating these crimes. In addition to offering technical and legal support to countries in developing their capacity to deal with crime related to patent infringement, the international organization also strives to promote knowledge, raise awareness and disseminate criminal patent protection practices.

2.2 Legal Procedures for the Criminal Protection of Patents

The issuance of a patent is a judicial right granted under the protection rights of inventors and the like, after procedural steps and procedures that include the investigation and collection of relevant evidence. Then, filing a complaint or complaint, after receiving and registering preliminary reports from the injured parties, initiates proceedings aimed at bringing a case against the guilty party. Finally, a judicial proceeding, such as a trial in which defendants are brought to courtrooms according to appropriate procedures, is judicially determined based on the nature and gravity of the alleged crime. Hearings are also held during which testimonies are presented and evidence is examined in order to decide whether a given perpetrator is guilty or not. The word clergy is a relic of medieval thought in the history of English education and culture [4].

Investigation and Evidence Collection

Special units are organized to deal with investigating cases of patent infringement. Team members chosen for investigation possess skills in legal and scientific spheres.

They gather all necessary evidence and information connected to the crime, study it, and then use it as evidence during court hearings. While the investigation is being conducted, the rights of the accused are safeguarded at all stages, and the confidentiality of data and documentation relevant to the case is ensured.

Filing Complaints and Grievances

Any person suffering the violation of patent rights has the possibility to present a lawsuit or a case to the concerned authorities that take care of protecting the patents. To do this, he must write and keep all information about the violation, including the evidence required. Complaints and grievances are reviewed, and appropriate action is taken on them. These actions might involve hearing from both sides, examining details and testimonies in order to verify the validity of the complaint, and even taking necessary legal action(s).

Judicial Procedures and Trials

The process of seeking legal redress after investigations have been done and complaints filed is to begin judicial proceedings which will hear the matter. The courts receive the lawsuit, review it following rules and principles of law, and make decisions accordingly. The evidence presented in court, including testimony given by involved parties, is carefully scrutinized, analyzed, and used to establish a verdict based on fact. This particular step ensures the rights of the accused are safeguarded while at the same time informing them of the charges leveled against them, giving them room to defend themselves.

3 Intellectual Property Crimes Related to Patents

Any infringement of intellectual property rights or fraud, such as counterfeiting and counterfeiting of patents, carries severe penalties. These types of crimes have a huge impact on society. Falsifying the actual patent rights of an invention or altering the actual patent rights is considered a crime because it constitutes a brazen infringement of intellectual property rights. These and other laws aim to limit our legal system, which has been implemented to ensure that intellectual property rights are protected in an inviolable and reliable manner in Jordan.

3.1 Types of Patent Crimes

Internationally, patent protection includes better law enforcement and criminalizing patent crimes in the purest sense of the word. For example, patent crimes are a series of infringements of intellectual property rights in which there should be close coordination between invention, innovation and technology development. These crimes may also include falsifying and manipulating patent documents in order to assert

rights that do not belong to them. In addition, these offenses cover theft and stealing others' inventions, where persons illegally take or borrow the invention of the inventors to use it for their own benefit or gain. Finally, they include industrial piracy and unlawful replication, where products or innovations are copied without authorization from the original owner and sold unlawfully with no regard to intellectual property rights [5].

- **Forgery and Manipulation of Patent Documents**

Forgery and manipulation of patent documents are among crimes in relation to patents. It is carried out by counterfeiting or altering patent-related documents to get property rights they do not deserve. The aforementioned documents are certificates, technical reports, records, and any proof linked to an invention. This offense discredits the official registries of patents, harms the true inventor, and disrupts his lawful rights. Judicial as well as law enforcement organs should make investigations on this crime and take the essential steps necessary to fight it, as well as subjecting penalties upon those involved according [6].

- **Violations and Unlawful Use of Patents**

To infringe the intellectual property rights and to destabilize the balanced system of innovation and scientific, as well as technological activity in society are major crimes due to patent infringement and illegal use. This comprises the unlawful application of patents without first seeking permission from the creator or manufacturing and marketing goods which violate intellectual property rights. These acts have been illegalized according and they incur severe legal punishment to perpetrators [7].

- **Fraud Related to Patents**

In the realm of intellectual property protection, patent fraud stands out as a grave offense which employs deceitful means to misguide and exploit public perception resulting in enormous economic losses. This may involve acts like falsifying patent details or issuing deceitful information to organizations or government offices. The Jordanian legislation lays particular emphasis on eliminating the menace of patent fraud and applies substantial legal sanctions against perpetrators engaged in these activities.

- **Theft and Appropriation of Others' Inventions**

Crimes involving patents are theft and appropriation of others' inventions. This crime happens when a person takes or seizes the inventor's identity with an intention to use it for their benefit or for an illegal gain. The act involves tricking and cheating the patent system by assuming the role of the inventor or utilizing ideas and trade secrets without due authorization. The latter kind of behavior is a complete and unmistakable infringement on the real inventor's intellectual property rights; hence, the criminals have to suffer corresponding criminal penalties [8].

- **Industrial Piracy and Unlawful Imitation**

Patent infringement and unauthorized duplication are crimes that fall under the purview of patent law. This criminal act happens when items or inventions are replicated in violation of the original patent owner's consent. Such an action can be seen as depriving the genuine innovators of their legal rights on intellectual property, which are essential for fair competition in markets. It involves producing and distributing counterfeits legally, imitating original products quite convincingly that lead to substantial damages for the genuine inventors. Therefore, this crime must be combated through intervention from judicial and law enforcement agencies who should ensure proper penalties imposed on criminals and protect the right of inventors over intellectual property.

3.2 Criminal Penalties for Patent Infringement

The range of consequences faced by the patent infringers in the form of criminal penalties is known to encompass financial fines, criminal sanctions, and administrative sanctions that are established by legislation and laws adopted in a country. Such penalties are meant to discourage individuals and companies from engaging in patent infringement acts as well as emphasize the significance of intellectual property rights and their protection. These penalties, on their part, contribute greatly to the protection of inventors' rights while also fostering innovation and scientific research. The Jordanian legislation defines the penalties that can be enforced if patents are violated, thus safeguarding patents. The penalties are designed to ensure effective deterrence and underscore the significance of safeguarding copyrights; they include levying hefty financial fines against offenders and meting out long prison sentences. These deterrent measures help avoid offenses and secure fair treatment in such patent-related criminal cases as they appear [9].

1. **Criminal Penalties**

Among the factors, legislation enacted in Jordan is characterized by stiff penal actions to protect patent rights. Violators can also be sentenced to imprisonment of varying duration depending on the degree of violation. Such penalties are designed to discourage future violations and establish justice as part of the overall commitment to uphold patent protection laws. There are several legal documents and laws that deal with patent penalties. They include statutes and other relevant legislation which aims to give the fines, both legally exact and binding, for infringements of patent rights. Such laws concentrate on defending intellectual property and protecting creators from their rights being violated. They serve as pivotal components for promoting a healthy balance between business relationships and social innovation while fostering an adequate reaction to incidents of infringement of intellectual property rights. Also, general deterrence is achieved through the imposition of high legal penalties for any violations in the field of patents based on legal texts.

Also, the recent amendments of legal texts concerning the patent penalties are designed to update and improve this sphere of law, while the legislative basis is important. The ongoing development of laws in this area is vital to cope with evolving trends in intellectual property protection and emerging trends from other countries. Such recent amendments have emerged from experience as well as the international pattern of criminal punishment for patents. The innovations are aimed at bringing fairness into the process, improving the effectiveness of penalty execution, and reinforcing IP law application.

2. **Civil Penalties**

In addition to criminal penalties, the concerned law provides for civil penalties against patent infringers. They may be known as financial compensation, inextricably linked to the equivalent loss caused to companies for which we hold a patent as a result of patent manipulation or infringement. They are intended to settle all monetary obligations arising from intellectual property rights.

3. **Financial Penalties**

When a product patent is infringed, criminal and civil penalties include financial penalties. Monetary penalties may include damages or fees paid to persons whose property rights have been infringed by the infringer, and may take the form of monetary damages, for example in the case of infringement of a product patent. The degree of violation will also determine the amount of fines imposed by statute or law. Financial penalties are essential to stopping the act of infringing intellectual property rights and preventing the theft of inventors' rights or ideas.

4. **Criminal Penalties**

Criminal charges typically involve legal consequences for patent infringers who have broken criminal law. The penalties that may be imposed are a fine and imprisonment. Criminal sanctions are imposed when the infringement of intellectual property rights would cause a market collapse or huge losses for the inventor. In other words, criminal penalties also tend to deter patent infringement and effectively protect inventors' rights [10].

5. **Administrative Penalties**

Administrative penalties are an important means of protecting patents and ensuring criminal justice. These penalties can involve administrative actions that are imposed by the respective authority, such as patent cancellation or removal of rights to exploit. Administrative penalties are aimed at ensuring respect for intellectual property rights rules and preventing individuals and firms from violating those rules. These penalties go hand in hand with both civil and pecuniary penalties to keep the whole scheme of criminal protection intact.

One major effect of the criminal penalties on patents is that they have a legal impact that is not easy to be removed from the offenders. In cases where criminal penalties are applied, it helps to stop future violators because they are brought to justice in addition

to being held accountable for the amount of financial recompensation needed to pay back the aggrieved parties as well as compensation for the damages on society and economy. In like manner, imposition of criminal penalties for patents has an overall impact of promoting protection of intellectual property rights by making it explicit and emphatic that infringement of any rights exposes one to prosecution under severe consequences of laws and regulations related to patents; this enhances respect and adherence to patent laws and regulations in turn.

The legal consequences of criminal penalties in patent violations are quite severe, and due to the imposition of criminal penalties, violators do realize how grave the offense is and how serious their repercussions are. So, in turn, this scares violators from even thinking about infringing patents again. It works to achieve justice and deterrence in the community by ensuring that wrongdoers are held accountable for their acts and punished under concerned law.

It is evident that criminal penalties on patents have far-reaching implications in society and the economy. Such penalties contribute to the general protection of society and the economy from negative consequences of infringements of patent rights. The role of criminal penalties in preventing future violations decreases the use and trade in counterfeit IP products. Furthermore, the impact of criminal penalties promotes trust in the legal system and stimulates innovation and investment for economic growth and overall societal development.

Penalizing intellectual property rights with criminal laws is a way of restoring and protecting this right, ensuring the survival of the law, taking into account undoubtedly that one cannot commit copyright infringement and believe that the end will not be fatal because the punishment will eventually come. So everyone is in a sense blue-green because respect for intellectual property rights will increase once a legal framework is implemented to protect intellectual property rights and penalize these intellectual works. This is a way to respect innovation in the country and support creativity [8, 9].

The competent authorities are responsible for imposing criminal sanctions in the event of patent infringement acts. These include the judiciary, which is known for its independence, transparency and impartiality in infringement cases. These institutions should encourage the Ministry of Justice and other judicial authorities to engage in enforcement in a manner that ensures justice.

Another important aspect is the accuracy of court decisions, which are another type of legal material used in patent law. These decisions come in two types; judgments and resolutions of competent courts in cases of infringement of intellectual property rights, in which they interpret the applicable provisions and principles and determine the manner in which the penalty will be imposed for the infringement. They are seen as overarching guidelines for the executive and judicial authorities, aimed at controlling penalties for offenses occurring in the field of patents and shaping the level of vigilance among the various stakeholders in this context. In addition to discussing the challenges and the current legal system regarding patent protection.

Some of the main challenges arising from patent law are rooted in legal challenges based on several loopholes and weaknesses that patent protection laws have had in the past and continue to witness. Technical challenges can be part of these challenges,

where they are difficult to apply and implement intellectual property rights and patent protection in the face of continuous technology advancements. Moreover, patent protection of global developments greatly affect Jordanian law since it has to match with international developments for proper effectiveness criminal protection for patents.

- **Legal Challenges**

Among the legal challenges in safeguarding patents are many loopholes found in the said laws and regulations. This may include vagueness of definitions as well as legal concepts linked to intellectual property rights and patents. Further on, it might be troublesome for criminal punishment under currently established laws to be executed accordingly, thus impeding the operational effectiveness of the system of criminal protection for patents. On this basis, the parliament should take action to amend these laws so that legal patent protection will be enhanced.

- **Technical Challenges**

Some technical problems that Jordan encounters in safeguarding patents are related to the difficulties that stem from innovation and rapid advances of technology that make it hard to apply and implement IPRs. The developments in information technology make it complicated to detect and prove these patent infringements related to unauthorized use because the technical details involved in these patents are not understood. Furthermore, electronic piracy as well as digitalization also contribute to some problems regarding how technology plays a role in preventing patent protection in Jordan [11, 12].

Jordanian criminal protection of patents could also be shaped by international legislation and agreements, in particular, those pertaining to intellectual property rights. To be more precise, if there is any new global development in terms of criminal protection for patents that might be deemed beneficial to Jordanian laws and standards, then it should be put into practice. Therefore, it is recommended that Jordan maintains active communication and coordination with international bodies involved in regulating global developments to ensure its laws are up-to-date and aligned with them [13–15].

Patent protection is an international legal challenge due to globalization. The increase in trade and cross-border communication makes patents vulnerable to infringement beyond national borders. It is for this reason that countries should come up with ways of dealing with issues that relate to the law, like how the national laws are applied differently by other countries and the court system, as well as judicial and legal practice, also varies. Furthermore, countries must work closely to promote international patent protection and cooperate using legal channels in sharing information on patents to address cross-border infringements effectively [10, 13].

The progress in the patents industry now commands international cooperation and the exchange of information as fundamental to the effective criminal protection of patents. Countries can take steps towards strengthening international cooperation by exchanging information and experience on patent offenses. This level of cooperation

can also comprise creating joint databases, which would store all the necessary information concerning patent infringement and improving knowledge through training courses and international workshops. There is also a necessity to create effective means that would enable the quick and reliable transmission of information about criminal offenses committed in one country to corresponding foreign authorities.

4 Conclusion

Having thoroughly researched the system of criminal protection for patents in Jordan, a number of significant findings and suggestions have been arrived at. The very first thing that must be done is to improve national legislation in this area by revising and updating it, so it can meet the requirements of this rapidly developing sphere. Apart from that, financial as well as technical assistance should be supplied to the General Intellectual Property Authority, judicial bodies, and security agencies dealing with patent protection to enable them to perform their functions effectively. Moreover, it is essential that efforts should be stepped up to increase the level of awareness in our community concerning IPRs and patents via conducting awareness programs, educational conferences, and workshops. Jordan's government should also engage with the concerned international organizations to develop international cooperation in the area of patent protection by sharing data and expertise as well as benefiting from all possible resources that can enhance Jordan's capacities in this subject matter.

4.1 Results

The use of criminal sanctions for patent infringement serves as an effective measure to prevent violations and also has a significant legal impact on the violators. Criminal sanctions are one of the most powerful deterrent measures against future offenses and serve as the accountability medium towards compensating affected parties and reversing losses inflicted upon society and the economy. Besides, these penalties also enhance IP protection at large by reflecting that the violation of intellectual property rights would lead to severe legal consequences, establishing respect for the law and promoting adherence to rules and regulations governing patents.

4.2 Recommendations

The legal and legislative recommendations derive from the findings of the study, and their purpose is to improve the efficiency of criminal penalties for patents as prescribed in Jordanian law. First, it is suggested that legal amendments be enacted with a view to broadening the coverage of crimes through innovation of new ways

of patent infringement and then by updating them as per contemporary ideas on IPR protection. Secondly, coordination among the responsible organs for implementing the criminal punishments should be improved through exchanging information and expertise to ensure that such punishments are effectively administered. Finally, attention must be given to increasing legal knowledge, understanding, and public awareness about penalties set out under criminal statutes relating to patents. For further study, it is recommended that researchers focus on how the criminal penalty for patents affects the professionalism and legal behavior of administrations, companies, and individuals in the field of intellectual property protection. Additionally, studying the experiences of other countries in implementing criminal penalties for patents, extracting lessons learned, and applying them in Jordanian law is crucial. Furthermore, future research should focus on analyzing the economic and social aspects of implementing criminal penalties for patents and evaluating their effectiveness in promoting innovation and stimulating investment in the field of intellectual property.

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Technological Impact on the Evolution of Sentencing Practices in the Criminal Justice System: A Critical Analysis of Recent Legal Changes



S. EI-Manaseer, Omar Almakhzoumi, Ali Awwad Aljabrah, and Jalal Hussein Hamdan Alkayid

Abstract This study focuses on recent changes in the criminal justice system's approach to sentencing practices—changes that are partly related to legal reforms in sentencing and partly to the increasing impact of technology on the criminal justice system. As a country, we have not always offered so many excuses and justifications for reducing sentences. Factors such as youth, maturity and sincerity used to be the basis for a reduced sentence, but even this has changed. If the family or victim of a sexual offense against a minor or disabled person decides not to pursue criminal proceedings, the sentence is generally no longer carried out. The penalty for the same type of crime is more severe and less forgiving when the perpetrator is a repeat offender, when the crime has been committed of a specific type depending on nationality and place of residence, and when fewer crimes are considered "less serious" much less likely. In this study, I will argue that these recent legal developments are closely linked to technological developments and the increasing role of digital tools and data analytics in judicial decisions and enforcement mechanisms. My goal is to highlight the dynamics of these legal changes and their causes, with particular emphasis on the impact these changes have on the criminal justice system as a whole.

Keywords Judicial perspective · Penalty · Criminal judiciary · Technology

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1 Introduction

In recent years, sentencing in general and special criminal courts has changed significantly, with a tendency to reduce or even commute sentences. This means there will be no harsh or harsh behavior, especially if the victim is old, young or disabled. Interestingly, both the Court of Appeal and the Supreme Court affirmed these decisions. Therefore, our study, titled "New Perspectives on Criminal Penalties in the Legislature and Judiciary," explores this topic from both academic and practical perspectives.

1.1 Study Objectives

The purpose of this study is to explain the reasons and justifications for punishment cloaked in harshness and severity and to determine whether these reasons and justifications are justified, while introducing a new legal perspective from the perspective of the victim and victim. The perpetrators launched an investigation.

1.2 Significance of the Study

The significance of this study lies in its attempt to explore and address a topic that has yet to be studied in depth by legal scholars and criminal justice practitioners. It is also intended to take a firm stance on cases, actions and conduct that lead to the judicial view of criminal sanctions moving from reduction and mitigation to escalation and intensification. The study examines relevant legal texts and clarifies whether they allow or prohibit such changes.

1.3 Study Problem

The problem of this study is to answer the following question: Which crimes or situations fall within the scope of the new judicial view of criminal sanctions?

1.4 Study Questions

This study seeks to answer the following questions:

1. To what extent does age, whether young or old, influence the new judicial perspective?

2. How does the criminal judiciary view judicial confession when pronouncing penalties?
3. Does dropping personal rights lead the judiciary to view the offender with mercy or severity?
4. Does the type, gravity, and repetition of the crime have any impact on the new judicial perspective on penalties?

1.5 Study Methodology

The researchers used an analytical approach by presenting and analyzing legal texts, court decisions and legal opinions to assess the extent to which the criminal justice system successfully implements its new perspective on punishment when delivering criminal convictions.

2 Age and Its Impact on Criminal Penalties

Punishment refers to the penalty prescribed by law for a person who commits or fails to commit an act that is considered a criminal offence. It is a form of punishment that affects the offender for the benefit of society, the individual, the offender and the victim. The social benefit is to deter the public, the benefit to the victim is to ensure that attacks on the victim will not go unpunished, and the benefit to the perpetrator is to prevent the crime from happening again through deterrence and punishment. This is the so-called social benefit known as concrete deterrence [1].

To understand the impact of age on sentences imposed by the criminal justice system, researchers divided the topic into the following two branches:

2.1 Youth and Its Impact on Criminal Penalties

The researchers were not referring to a specific age of criminal responsibility, but to categories of young people, namely those in adolescence, pre-teens and older adults. This usually refers to people under the age of forty. If someone in this age group is proven guilty of an offence, the Crown Court will usually impose the minimum sentence for the offense they committed. In some cases, the minimum level was even exceeded, taking into account the age of the offender. For example, if a person in his 20 s commits the crime of resisting official duties, which carries a minimum sentence of one year and a maximum sentence of three years, the court may first sentence him to one year in prison but then decide to reduce his sentence to one year. A week, two weeks or a month, factoring in their youth.

This practice is common in lower courts, including the Court of Conciliation, Early Judiciary, Municipal and State Property Courts, and the Amman Municipal Court. These courts impose the minimum sentence first and then reduce the sentence, regardless of the length of the sentence. Be it a jail sentence or a fine. This applies to crimes for which no victim has complained, in particular crimes against agriculture, the environment, traffic, weapons and ammunition, crime prevention or antiquities laws.

The loss of personal rights of the complaining victim has no effect on the reduction of sentence. The court held that the reduced sentence was reasonable on the grounds that the offender was young because he was still in his prime. This is an unreasonable approach. The main purpose is to claim that the perpetrator is still in his prime as a teenager. Criminal courts of first instance continue to impose minimum sentences and, with the support of courts of appeal and even the Supreme Court of Appeal, reduce sentences in the absence of complaining victims [2].

Young people's views on justice have completely changed. By the end of 2019, the criminal justice system will no longer consider juveniles as a mitigating factor for most sentences. The reason is that young people are more likely to commit crimes, which is not a valid mitigating argument. Lower courts follow the same approach as the Supreme Court and the Court of Appeal [3].

Researchers believe that the Jordanian criminal justice system is moving in an unsuccessful and misleading direction by no longer considering youth as a mitigating factor in reducing sentences. This decision was deemed inappropriate as it was inconsistent with the principles of justice. Researchers support this view on the following points:

1. The Jordanian criminal justice system refuses to consider juveniles as a valid reason for a reduced sentence or to include it as a discretionary mitigating factor, which makes the reduction of sentences insufficient [4]. This is merely judicial opinion and reasoning that departs from the true meaning and intended design of the mitigating discretionary factors. Discretionary mitigating factors are conditions provided by law that are not specifically defined and whose assessment is left to the discretion of the judge so that the sentence may be reduced if the circumstances justify it [5]. This is the implementation of considerations of justice based on the principles of social defense policy, where the determination of punishment is based on the future of the offender and not only on his past [6].
2. The law does not specify mitigating factors because they are numerous and difficult to enumerate [7], and their content and quantity are not specified. The law therefore leaves their decision to the judiciary. Therefore, it is necessary to maintain the court's original approach of using youth as a discretionary factor in mitigating punishment. In this context, youth refers to people who do not have much life experience and are still in their prime. This does not apply to serious crimes such as murder, rape, theft or other serious crimes, but to petty crimes, crimes without a victim's complaint or crimes in which one's rights are waived. Therefore, the Jordanian criminal justice system would do well to reconsider its current position and return to previous judicial practices.

2.2 Old Age and Its Impact on Criminal Penalties

The law does not stipulate an age, nor does it specify a specific age of seniority, but it is customary to consider those over 60 years old to be senior citizens. Older people are not immune to making mistakes, and it is conceivable that they may commit crimes. When older adults commit crimes in the past, judges view them with compassion and human compassion [8]. Their sentences were lenient, meaning that after they were sentenced to the minimum sentence, the minimum sentence was further reduced. Judges make decisions based on the offender's age, frailty or difficulty adapting to prison conditions. However, with the passage of time, judicial concepts have changed, and there are currently very few judgments that use age as a valid reason for reducing the sentence [9].

Therefore, it can be said that general judicial practice in Jordan generally does not use age as a reason for reducing sentences. Therefore, the question is: Is it impossible to establish a general rule or a specific framework for determining whether age can be considered a mitigating circumstance?

Although judges have discretion to determine what constitutes mitigating discretion and the law provides this freedom, judges may apply age on a case-by-case basis. For example, if an older person commits a serious crime such as rape, assault, human trafficking, or other serious crime, age should not be considered a mitigating factor due to the seriousness and seriousness of such crime. On the other hand, if the crime committed by an older person is a misdemeanor or misdemeanor, there is no harm in considering age as a reason to reduce the sentence.

3 Confession and Waiver of Personal Rights and Their Impact on Criminal Penalties

It can be said that the development of the Jordanian criminal justice system is not limited to one aspect, but also extends to guilty pleas and the surrender of personal rights. To understand the changing judicial perspective on its impact on sentencing, researchers have divided the topic into the following two branches:

Confession and Its Impact on Criminal Penalties

In the absence of a clear concept of guilty plea in both legislation and judicial practice, lawyers have developed various definitions for it. Legal scholar Ahmed Surul defines it as "an admission by the accused to the commission of an act constituting in whole or in part a crime [9]". Criminal lawyer Mahmoud Mahmoud Mustafa defines it as "the defendant's admission of the charges against him" [10].

There are two views regarding the impact of guilty pleas on sentencing in the Jordanian criminal justice system. In the first case, the defendant's confession was considered a mitigating circumstance, which resulted in a reduced sentence. This means that if the defendant pleads guilty, the minimum sentence will be imposed

and then, based on the confession, mitigating factors will be applied to further reduce the sentence. During this period, the judicial authorities regarded confessions as one of the most important mitigating factors [11].

The Jordanian criminal justice system has used honesty in the past to use confessions as a mitigating factor in determining penalties, particularly for crimes where the victim did not complain or where the victim waived personal rights. For example, if a defendant pleads guilty to a traffic offense such as running a red light, the court will initially sentence him to the minimum sentence for that crime. Then, based on her confession, the penalty for the crime will be further reduced.

It can be concluded that based on this theory, the Jordanian criminal justice system considers guilty pleas as a mitigating factor. This view was abandoned, however, in favor of the alternative theory that judicial confessions were not mitigating factors and were not sufficient to mitigate punishment. In view of this approach, many court decisions have been issued with the support of the Supreme Court [12].

Researchers argue that not considering confession as a mitigating factor is misplaced for the following reasons [13]:

1. Since the law neither specifies nor limits the terms and examples of discretionary mitigating factors, there is no harm in treating confessions as mitigating factors.
2. A legally valid confession that meets all elements and conditions facilitates the work of the court and simplifies the trial process, justifying its consideration as a mitigating circumstance.
3. Pleading guilty is a virtue, and pleading guilty is a form of self-purification and support in court. Therefore, it is reasonable to consider this as a mitigating discretionary factor.
4. It is unfair to treat a perpetrator who continues to deny the crime the same as a perpetrator who admits to the crime he committed. The former prolongs the legal process, while the latter speeds up the legal process.
5. Withholding a confession as a mitigating factor does not encourage a criminal to plead guilty because he knows that his confession will not reduce his sentence.

Therefore, it would be preferable if the judicial practice reverted to its previous stance, where judicial confession is considered a mitigating discretionary factor [14].

Waiver of Personal Rights and Its Impact on Criminal Penalties

In order to understand the impact of the waiver of personal rights on criminal sanctions, this term must be clarified. Since there is no legal definition of giving up personal rights, some cases define it as the expiration of the right to appeal and the right holder, his representative or legal representative giving up this right [15].

Concerning the impact of waiving personal rights on the criminal penalty, researchers elaborate on the following facts and issues [16–18]:

- First, the view that the Jordanian criminal justice system would waive individual rights as a discretionary factor in mitigating sentences has remained constant for all types of crimes since its inception until around the end of 2013.

- Second, a new Jordanian criminal justice ideology emerged around the end of 2013, particularly in the criminal justice functions of the Grand Criminal Court and the Supreme Court. This ideology questions the validity of the waiver of individual rights and does not rely on it as a mitigating factor, particularly in cases involving attacks on the dignity of victims under 18 years of age or persons with disabilities [19].
- Despite the lack of clear legal text, the judiciary reiterated its commitment to criminal protection in this regard. For example, if a guardian waives his personal rights against the perpetrator of an attack on his minor or disabled daughter, the Grand Criminal Court will not accept that waiver, a position confirmed by the Supreme Court.
- Third, the new judicial perspective of abandoning individual rights in cases of crimes that violate the dignity of minors and persons with disabilities forces the legislature to address these issues in the Criminal Code. An amendment has been proposed to make it clear that: "With respect to offenses against dignity within the meaning of this section, no mitigating circumstances shall apply if the victim, whether male or female, was under the age of eighteen at the time of the commission of the offense, or" has a disability "And the offender is over eighteen years old" [20].
- Fourth, the Jordanian criminal justice system still considers the renunciation of personal rights as a reason for reduced sentences for many crimes, as stated in the Penal Code. These crimes include crimes related to minors and persons with disabilities (Articles 287-29), homicide (Article 258), crimes related to incitement to debauchery, moral crimes and crimes against public morals (Articles 309-320), as well as the crime of seduction and indecent assault when the victim is not a minor or disabled (Articles 304-308) [21–23].

Given the severity and gravity of these crimes, it is recommended that the legislator refrains from resorting to mitigating factors in general and waiving personal rights in particular [1].

4 Type of Crime and Recidivism and Their Impact on Criminal Penalties

It appears that the new judicial perspective on criminal sanctions is far-reaching, insightful and comprehensive. It is not limited to reconsideration of penalties for crimes committed by minors or adults, or for crimes involving judicial guilty pleas or a waiver of personal rights. Rather, it covers specific types of crime and recidivism [24, 25]. In order to understand how the Jordanian criminal justice system has changed its view of punishment for certain crimes and what punishments are imposed on re-offenders, each aspect will be discussed separately in separate sections of this edition. Below we explain how each aspect is handled [26, 27]:

4.1 Type of Crime and Its Impact on Criminal Penalties

In order to maintain the independence of the judiciary and judges and ensure that they fulfill their duty to deliver justice while maintaining their dignity and status, the Jordanian Judicial Council regularly organizes dialogues, seminars and training courses for judges [28–30]. The sessions will cover a variety of topics including the need for punishment for specific types of crime to act as a general and specific deterrent, fairness and proportionality to the crime committed, particularly for those of a certain seriousness or pervasiveness in society. Their punishment does not serve as a deterrent [31].

Researchers believe the recent trend in the criminal justice system to increase penalties for such crimes is a smart and laudable direction. There is no doubt that these crimes have increased recently to the point where minimum sentences are no longer a deterrent [32–34].

4.2 Recidivism and Its Impact on Criminal Penalties

The Jordanian Penal Code does not clearly define recidivism; it simply lists its terms and conditions [35]. However, Jordan's Supreme Court defines recidivism as "a legal description that applies to persons who commit crimes again after having been convicted under a previous sentence" [36]. The offender himself, regardless of the material aspects of the crime committed [14].

Regarding the judicial perspective on the impact of recidivism on the imposed criminal penalty, researchers point out the following.

1. In the past, recidivism penalties were often theoretical rather than implemented in practice. Because when a criminal court receives an investigation file and initiates a criminal prosecution, it is submitted to the criminal court by the defendant on the grounds of committing a specific crime in accordance with the legal provisions governing the crime. However, Articles 101 and 102 of the Criminal Code on recidivism do not specifically refer to legal texts on recidivism.
2. Currently, prosecutors have access to criminal records of offenders directly or through specially provided portals due to electronic links between prosecutorial offices, correctional institution administrations and criminal information management systems, as well as the existence of electronic criminal records. The Public Security Bureau is responsible. After the prison management department retrieves the criminal record and executes the sentence, the defendant is determined to be a repeat offender.
3. Sometimes, a defendant is referred to court as a recidivist under the legal definition of Sections 101 and 102 of the Criminal Code. However, the investigation file does not contain a certified copy of the final judgment against the defendants.
4. Finally, if the court determines that the defendant is a recidivist based on the recidivism provisions, the penalty at sentencing will be severe. Offenders do not

benefit from mitigating discretionary factors, minimum or maximum sentences. Instead, impose strict penalties for repeat offenders. With the introduction of modern technology and the use of criminal records, this method has been used and practiced in criminal courts for many years. Therefore, it can be said that the fallback clause is no longer theoretical, but valid, enforceable and strictly applicable.

5 Conclusion

This study explores new legal perspectives on punishment in the Jordanian criminal justice system. This subject is closely related to principles of criminal procedure, criminal law, criminology and punishment. This also affects the work of judges, lawyers, professors and students in law schools and law schools. The study yielded several findings and made various recommendations, summarized below.

5.1 Findings

1. There have been significant and dramatic changes in the severity of penalties in recent years. The previous lenient, blunt punishments moved toward increasingly severe punishments designed to achieve the goals of punishment, including general and specific deterrence, justice, and not driven by excess, revenge, or personal motives.
2. The ineffectiveness of light, simple sentences leads judges to reconsider their sentences when convicting.
3. A general increase in criminal activity and a continued rise in certain crimes are forcing judges to impose deterrent sentences.
4. The Jordanian criminal justice system abandoned many legal principles that had been valid and applicable for decades, such as age-related mitigating factors, and acknowledged that they were no longer applicable.
5. Jordan's criminal justice system was the first to protect minors and persons with disabilities from sexual assault before legislators formally codified and standardized these protections based on judicial precedent.
6. With advances in technology and the introduction of electronic criminal records, recidivists are no longer able to escape the consequences of reoffending, leading to stricter enforcement of recidivism statutes.
7. Increasing attacks on government property, utility networks, vandalism using corrosive materials and sharp objects, vehicle theft and arson are leading to judges imposing highly deterrent sentences.

5.2 Recommendations

1. Many of the penalties for offenses listed in the Penal Code and other substantive laws need to be re-evaluated as they are considered to be ineffective and non-deterrent, even with maximum limits. The penalties imposed in 1960 are no longer sufficient and appropriate for today.
2. Explicitly consider the age factor (both minors and seniors) as a discretionary mitigating factor, particularly in crimes against minors and persons with disabilities.
3. Explicitly treat a guilty plea as a discretionary mitigating circumstance, except for the crime of assault on a minor, and treat it as a mitigating circumstance for other crimes in which a person's rights are waived.
4. It is clarified that the relinquishment of personal rights is not an arbitrary mitigating factor in crimes against minors and persons with disabilities, regardless of the nature of the crime.
5. Explicitly consider an offender's serious health condition as a mitigating circumstance.
6. Make it clear that the use of discretionary mitigating factors should not reduce the minimum sentence by more than half.

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World Trade Organization in the Era of Digital Transformation: A Comparative Study of Applying Core Principles in the Digital Context



Omar Al Makhzoumi and Naif Abdullah Al-Amadi

Abstract The objective of this study is to evaluate the effects and prospects of digital transformation on the World Trade Organization (WTO). Employing a descriptive-analytical methodology, the research examined data and information pertaining to developments in digital transformation and their implications for the organization's policies and procedures. Findings indicated that while the WTO has met some of its fundamental objectives, including the promotion of international trade freedom and enhancements in living standards in specific regions, it has not fully realized all its goals across all nations. Additionally, the study revealed that the WTO's essential principles, such as non-discrimination and transparency, have played a role in improving the global trade landscape; however, challenges remain in the equitable application of these principles between developed and developing countries. In summary, the study advocated for increased transparency in decision-making processes and greater collaboration among member states to ensure an equitable and balanced enforcement of principles. It also urged a thorough review of the organization's structure, enhancements to the effectiveness of dispute resolution mechanisms, and the provision of technical support and assistance to developing nations to aid them in fulfilling their obligations. The importance of updating principles and policies to align with global changes and emerging challenges in international trade was emphasized, along with the need for knowledge and experience sharing among member states to promote mutual understanding and achieve collective benefits.

Keywords World Trade Organization · Digital transformation · International trade · Uruguay round · Non-discrimination principle · Transparency · Developing countries · Economic globalization

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1 Introduction

The World Trade Organization (WTO) operates as a global economic entity with its own legal identity, functioning within the structure of the contemporary global economic system to oversee and lay the groundwork for the international trading system. Its efforts are aimed at enhancing the liberalization of international trade and boosting global economic activity. Additionally, the International Monetary Fund (IMF) and the World Bank (WB) play roles in influencing and guiding international economic policies that affect diverse stakeholders worldwide [1].

The General Agreement on Tariffs and Trade (GATT 1947) was established in 1947 following the unsuccessful effort by the United States to form the International Trade Organization (ITO) based on the Havana Charter of the same year [2]. The application and practical experience of the GATT 1947 regulations highlighted significant shortcomings, revealing the system's inability to adapt to the evolving landscape of global trade. While the rules of GATT 1947 focused primarily on regulating specific aspects of trade in industrial goods, they excluded vast areas of international commerce, such as agricultural products, textiles, services, and intellectual property rights. Additionally, the interests of developing nations were overlooked, leaving these countries to grapple with issues of hunger, ignorance, and disease, having endured the impacts of colonialism at the time these rules were implemented. Furthermore, the GATT 1947 framework did not provide a permanent institutional structure to improve the oversight and enforcement of its regulations [3].

The shortcomings and inadequacies of GATT 1947 prompted developed nations to seek a new series of negotiations within the GATT structure, following seven unsuccessful rounds that had not addressed the problems they had generated. Additionally, developing countries contributed to the initiation of the Uruguay Round to push for the acknowledgment of their concerns and to alter the regulations of GATT 1947, which had imposed considerable difficulties on them.

Commencing in 1986 and wrapping up in 1994, the Uruguay Round, which represents the eighth round under the GATT 1947 framework, spanned nearly eight years of challenging negotiations. Viewed as a compromise among the clashing forces in the realm of international trade, the outcomes of the Uruguay Round also reflected the collective efforts of all negotiating entities and international bodies such as the United Nations. The final document was signed in Marrakesh, Morocco, on April 15, 1994, marking the conclusion of the Uruguay Round negotiations.

The inception of this document traces back to the creation of the WTO, formally known as the Marrakesh Agreement Establishing the WTO. It outlined the organization's functions, scope of work, structural organization, methods for acquiring membership, and its interactions with other entities. Implemented in January 1995, this agreement solidified all prior GATT agreements [4].

The most extensive and impactful of the negotiation rounds, the Uruguay Round marked a notable shift from earlier discussions. With a total of twenty-eight agreements, it established a thorough legal framework of regulations focused on trade liberalization and the reinforcement of the multilateral trading system. By refining

the rules within this system, the round significantly advanced trade liberalization, particularly through the enhancement of the dispute resolution mechanism. Additionally, it achieved agreements in emerging sectors such as trade in services and, for the first time, fully incorporated textiles and agriculture into the framework, though it excluded strategic commodities like oil and arms trade.

The Uruguay Round resulted in agreements concerning new domains, including trade-related aspects of intellectual property rights (TRIPS) and trade-related investment measures (TRIMS). Negotiations persisted beyond the conclusion of the Uruguay Round in February 1997, culminating in a telecommunications services agreement that saw sixty-nine governments endorsing far-reaching liberalization measures that surpassed those established during the Uruguay Round. Additionally, that same year, negotiations on information technology products concluded successfully with forty governments agreeing to eliminate tariffs, while an agreement on financial services was finalized by seventy member countries, encompassing over 95% of trade in banking, insurance, securities, and financial information.

At the Ministerial Conference in May 1998, WTO members consented to examine matters concerning global electronic commerce, and in 2000, fresh negotiations commenced with an emphasis on agriculture and services.

1.1 Study Objectives

This study aims to:

- Analyze the evolution of the WTO from GATT to the WTO, with particular emphasis on the impact of the Uruguay Round on the structure and organization of the organization.
- Assessing the economic and political impact of digital technologies on WTO activities.
- Analyze the principles that underlie the WTO and show how these principles are applied in the international context.
- Examine the organization's core goals, such as promoting freedom of international trade, raising living standards, achieving full employment, and stimulating effective demand.
- Analyze the organizational structure of the WTO, including key bodies such as the Ministerial Conference, the General Council, the Dispute Settlement Body, and the trade policy guidance mechanism.
- Explore the economic and political factors that led to the creation of organizations, such as neoliberalism, economic globalization, and the global justice movement.

1.2 Study Methodology

This research employs a descriptive-analytical method to evaluate the effects and prospects of digital transformation on the WTO. Data and information concerning developments in digital transformation and their implications for the organization's policies and procedures were analyzed using this approach. The study encompasses a review of literature pertaining to digital transformation and international trade, along with an assessment of the economic and political influences of digital technologies on the organization's functions. The objective is to deliver a thorough understanding of how the WTO navigates the challenges and opportunities posed by the digital era, utilizing data analysis and insights derived from earlier studies and reports published by the organization.

2 Principles and Objectives of the WTO

The WTO is based on several key principles, including [2, 4]:

1. **Principle of non-discrimination**: This principle implies non-discrimination between member countries or the granting of special treatment to one country at the expense of others. All GATT member countries should be treated equally in market competition, which means that any trade advantage granted by one country to another should benefit all member countries without the need for further action.
2. **Transparency principle**: This principle relies on tariffs rather than quantitative restrictions, which lack transparency. Tariffs should be set in a way that takes into account, where necessary, international trade. Countries that need to protect domestic industries or address balance of payments deficits should use price and tariff policies instead of quantitative restrictions such as import quotas. This is because within price limits it is easy to determine the level of protection or support for domestic products.
3. **Principle of trade negotiations**: This principle means that the WTO serves as the appropriate framework for implementing provisions or resolving disputes through negotiations.
4. **Principle of preferential trade treatment**: This principle involves granting developing countries preferential trade relations with developed countries in order to support the development plans of developing countries and increase their foreign exchange reserves.
5. **Principle of reciprocity**: This principle requires member countries to liberalize international trade by reducing or eliminating restrictions, but within the framework of multilateral negotiations based on reciprocity. This means that any reduction in tariff or non-tariff barriers by one country must be accompanied by equivalent reductions by the other.

2.1 Objectives of the WTO

The main goal of the WTO is to attain freedom in international trade by eradicating discriminatory practices that affect trade flow and dismantling any barriers or hindrances that may obstruct the movement of trade between nations [5]. Additional objectives consist of [2]:

1. Improving the standard of living for member countries.
2. Striving to achieve full employment levels within member countries.
3. Stimulating effective demand.
4. Increasing real national income levels.
5. Optimal utilization of global economic resources.
6. Encouraging production, capital movement, and investments.
7. Facilitating access to markets and sources of raw materials.
8. Reducing quantitative and tariff barriers to enhance international trade volume.
9. Establishing negotiations as the foundation for resolving international trade issues.

3 Organizational Structure and Membership of the WTO

3.1 Organizational Structure of the WTO

The structure of the WTO is composed of several bodies, briefly described as follows [6]:

1. **Ministerial Conference**: This body consists of all member countries at the level of foreign trade ministers and meets every two years. It has the authority to make decisions related to trade liberalization agreements, including restrictions on the provisions of these agreements.
2. **General Council**: This body is composed of representatives of all member countries and takes over the responsibilities of the Ministerial Conference between its sessions. Establishes organizational rules and procedural rules for itself and its individual committees. It is also responsible for coordination with other international governmental organizations whose responsibilities overlap with those of the WTO.
3. **Dispute Settlement Body**: This is one of the main bodies of the WTO and its jurisdiction covers all areas, including goods, services and intellectual property, in an integrated manner.
4. **Trade Policy Review Mechanism**: This mechanism is responsible for reviewing the international trade policies of member countries in accordance with the time frame specified in the agreement, which ranges from two years for developed countries, four years for developing countries and six years for least developed countries.

5. **Specialized councils**: These include the Council for Trade in Goods, the Council for Trade in Services and the Council on Trade-Related Aspects of Intellectual Property Rights. Each council oversees the implementation of agreements related to its specific area. Membership in these councils, which meet when necessary, is open to representatives of member countries.
6. **Secretariat**: This is an internal body of the WTO. The Director-General of the organization appoints its staff, defines their duties and establishes their conditions of service in accordance with the regulations established by the Ministerial Conference.

3.2 Decision-Making and Membership in the WTO

In the WTO, decisions are determined by a straightforward majority of votes, where each member possesses a single vote during sessions of the Ministerial Conference and the General Council. Membership is available to all member states of the United Nations. Nations that wish to join the WTO are required to comply with all agreements established since 1947, continuing until the transition of GATT to the WTO in 1995.

Joining the WTO does not entail the instant execution of all agreements; rather, this process occurs gradually. A transition period is permitted, lasting no longer than ten years, concluding in 2005.

Before a country can become a member, negotiations take place between the WTO and the aspiring nation, during which the specific areas of trade liberalization that the country will agree to are established according to its level of economic development. It is important to emphasize that joining the organization is not compulsory; countries voluntarily seek membership based on their assessment of the advantages it offers. However, in practical terms, it is nearly impossible for any nation to exist outside the global economic framework [7].

3.3 The Context Surrounding the Establishment of the WTO

Neoliberalism and Economic Globalization

Neoliberalism is fundamentally connected to economic globalization, which showcases the challenges of global capitalism and the reconfiguration of capital movement via multinational corporations. Globalization serves as both a crucial prerequisite and a tool for advancing the social agenda of neoliberalism, as it forces national identities to conform and adjust, simultaneously constraining the bargaining power of trade unions and movements advocating for social change.

This approach legitimizes and clears the path for representatives of neoliberalism on a national scale. Additionally, globalization emerges as a direct outcome of the

neoliberal intellectual initiative, as it enhances international economic interactions and mandates integration into the global marketplace.

The state serves a significant function in this context, acting as a shared platform for social groups or classes to pursue particular interests and establish equilibrium among them. This occurs via the impact of lobbying and interest groups on those who make political and administrative decisions.

Conversely, this aspect holds greater importance. Indeed, this influence is realized through the intertwining and circulation of social contradictions within the state apparatus, emerging as crises or challenges. The state addresses the demands of various interest groups and pressures because it embodies a tangible concentration of social power dynamics, which signifies that it assumes particular forms of authority and endeavors to uphold them.

The Global Justice Movement

In response to a range of pressing global challenges over the last twenty years, the idea of global justice has taken shape. This includes issues like workers' rights, the growing debt crisis faced by developing nations, environmental destruction and degradation of natural resources, food security, widespread poverty, and the privatization of essential services such as education, water, and healthcare. Academic interest in the principles of global justice has surged, focusing on both individual and institutional needs. Gaining traction, the global justice movement stands as the largest opposition to the effects of neoliberal economic policies within the three principal international economic bodies, IMF, WB, WTO, in addition to multinational corporations.

A diverse array of individuals and organizations makes up the global justice movement, encompassing non-governmental organizations, environmental coalitions, religious communities, student unions, and civil society institutions. This movement's actions have brought attention to the absurdities of neoliberal ideologies, globalization, and multinational corporations, resulting in a significant increase in nonviolent protests against WTO conferences held in [8].

4 Key Features of the Agreement on TRIPs

Research shows that the international trade system is now governed by new rules and foundations. A significant aspect of these rules is the interplay between trade and technological advancement, where knowledge, innovation, and renewal have emerged as the new standards for international competition in 21st-century trade dynamics. These elements constitute a vital component of production and serve as one of its essential pillars. Intellectual property offers the legal framework necessary to safeguard and support new ideas and creative thought, encompassing the protection of industrial property and the preservation of literary works, including software programs, as a fundamental right under the TRIPs Agreement within the WTO.

The TRIPs Agreement provides a comprehensive definition of intellectual property and details the methods for its protection. Intellectual property is characterized as "the creation of the human mind in all fields," whereas intellectual property rights refer to the entitlements of creators and inventors concerning artistic works, encompassing copyright, industrial design rights, patent rights, and trademark protection.

The establishment of numerous organizations aimed at safeguarding intellectual property rights has been driven by efforts in this area, with the World Intellectual Property Organization (WIPO) being particularly notable. Before WIPO's creation, several agreements were made to outline international responsibilities for the protection of intellectual property rights. Among the most important are the Paris Convention for the Protection of Industrial Property (1883) and its amendments from Stockholm (1967), as well as the Berne Convention for the Protection of Literary and Artistic Works (1886) and its 1971 revisions, along with additional treaties and agreements [9].

The inability to offer effective protection in these areas stems from the absence of mandatory enforcement power in these agreements. On the other hand, the TRIPs Agreement enhances these prior agreements by incorporating new areas of protection and has been made compulsory by developed nations through the connection of member states' responsibilities to the WTO's dispute resolution system. This framework fortifies the exclusive rights assured by the agreement, rendering them both mandatory and enforceable.

The longest agreement in the Uruguay Round agreements, the TRIPs Agreement consists of 73 articles. It focuses on integrating particular protection standards into the national laws of member nations, which are both agreed upon and enforceable within a multilateral framework, addressing every facet of intellectual property. This agreement tackles intellectual property in two primary domains: literary property and industrial property. Provisions of the agreement apply to all member countries, irrespective of their development status, with the sole variation being the grace periods allocated to developed, developing, and least developed nations.

Developing nations perceive the Uruguay Round, designed to both liberalize their markets and enhance intellectual property protections, as a means of solidifying the technological development monopoly held by advanced countries, making it solely their domain. This is accomplished by limiting access to cutting-edge technology for developing nations under the pretense of safeguarding intellectual property rights, which ultimately hampers their capacity to compete fairly and equitably.

The TRIPs Agreement encompasses fundamental principles and general provisions that uphold the most-favored-nation principle and national treatment, as acknowledged in the first and second articles of the international trade system. It stresses the importance of harmonizing the implementation of these articles with the specific nature and attributes of intellectual property, thereby ensuring that national inventors are not afforded greater protection than their foreign counterparts and that no bias exists between domestic and international innovations within a country. Additionally, the agreement outlines regulations for safeguarding various facets of

intellectual property rights, detailing the extent of this protection and the required enforcement procedures [9].

4.1 General Objectives and Basic Principles of the Agreement on TRIPs

Among the key provisions in the general rules of the TRIPs Agreement are Articles 7, which addresses "Objectives," and 8, which focuses on "Principles." These articles serve as protective measures for developing nations, with the goal of achieving a balance between safeguarding and enforcing intellectual property rights and promoting the public interest and welfare of communities [10].

Objectives

Article 7 aims to strike a balance between safeguarding patent holders, enabling them to innovate, create, and attain profitability, and the objective of transferring and distributing new technology for the benefit of technology users beyond just the inventors. It is essential to take into account the public interest of developing and less affluent nations. Nevertheless, this article has failed to translate into meaningful obligations, offering only extended transitional periods for developing countries, which are considered inadequate for protecting their interests [11].

Principles

Member states are granted the authority under Article 8 to implement essential measures aimed at safeguarding public health, ensuring food security, and promoting the public interest in sectors crucial for economic growth and technological advancement while adhering to the terms of the Agreement. This enables states to determine the pricing of medicines and food based on the actual needs and capabilities of their populations. Furthermore, states are required to adopt suitable actions to curb the misuse of patent rights or any practices that could hinder trade or negatively impact the transfer of advanced technology on an international scale. Additionally, states possess the right to enact laws to prevent monopolistic practices and dumping, as well as to incorporate provisions for compulsory licensing within their patent legislation, detailing the circumstances under which such licensing may be granted [2, 12].

4.2 Fields of Application of the Agreement on TRIPs

The Agreement defines the types of intellectual property rights and the standards related to the provision of protection and enforcement, which are the cornerstones of the TRIPs Agreement. The eight fields of intellectual property are as follows:

- **Copyright and Related Rights**: This includes the rights related to literary, scientific, and artistic works.
- **Trademarks**: This includes distinctive marks related to services (Service Marks).
- **Geographical Indicators**: These indicate the origin of goods.
- **Industrial Design**: This includes new innovations related to the exterior and aesthetic appearance of industrial products.
- **Patents**: These are granted to inventors for their new ideas that are industrially applicable.
- **Layout-Designs (Topographies) of Integrated Circuits**: This pertains to the design of integrated circuits.
- **Undisclosed Information**: This includes trade secrets.
- **Control of Restrictive Practices and Contractual Licenses**: This pertains to the regulation of restrictive business practices and contractual licenses.

Some literature suggests that the eight fields of intellectual property can be classified into two broader categories: literary property and industrial property [13].

Literary Property

- **Copyright and related rights**: These include rights related to literary works, which can be divided into economic rights (such as reproduction, artistic performance, translation, broadcasting and recording) and moral rights (protecting the author's work against distortion or damage). Both types of rights are exclusive and allow the rights holder to grant licenses [14, 15].
- **Computer programs or software**: As a new field requiring protection, the TRIPs Agreement allows the copying of intellectual works to develop and improve software, enabling developing countries to create cheaper computer programs.
- **Rental rights**: These enable authors, particularly in the field of computer software and cinematographic works, to authorize or prohibit commercial rentals [15].

Industrial Property

- Industrial property encompasses various regulations that address four fundamental categories: trademarks, geographical indications, industrial designs, and patents.
- Exclusive rights concerning the use of trademarks, designs, indicators, and patents are enjoyed by rights holders. Concerns related to the overprotection of intellectual property rights, which may impact fair competition regulations in economic activities, are addressed in Article 40, particularly from the perspective of developing nations [11, 15].

4.3 The TRIPs Agreement and Public Health

A significant subject of debate at the Fourth Ministerial Conference held in Doha in November 2001 was the connection between public health and the TRIPs Agreement. The Doha Declaration sought to place "public health" above intellectual property rights, facilitating access to affordable medicines for developing nations. It

highlighted that member countries are not hindered by the TRIPs Agreement in their efforts to safeguard public health. This declaration regarding TRIPs and public health ignited extensive discussions in Geneva, where the U.S. administration, facing pressure from pharmaceutical companies, endeavored to retract the goals outlined in the declaration.

Countries with emerging and limited development urge a balance between the exclusive rights held by pharmaceutical firms and patent owners and the right of their citizens to access innovative medications at affordable costs [14].

4.4 Fields of Patent Application

One of the most crucial components of the TRIPs Agreement, patents play a vital role in the economy of developing nations, especially within the pharmaceutical industry. According to Article 27(1) of the Agreement, protection is provided for any invention—be it a product or a manufacturing process—across all technological fields without discrimination tied to the location of invention or the area of technology. However, there are exceptions concerning human, animal, or plant life, significant environmental damage, or harm to economic development.

Article 27 holds significant importance for the pharmaceutical sector, particularly in developing nations. The second paragraph of Article 27 permits exceptions to patent grants in cases where they violate "public order" or adversely affect national communities [15].

The protection of public health in developing nations has emerged as a crucial issue on the agenda regarding the general review of the TRIPs Agreement. This concern is particularly urgent given that significant portions of the populations in these countries, especially in Africa, do not have access to essential medicines [14, 16].

There are those who contend that Article 8 of the Agreement, addressing its objectives, allows member nations to bypass pharmaceutical patents without the consent of the patent holder when it is essential for public health. Nevertheless, this action must align with the stipulations of the Agreement and adhere to what is referred to as the "Necessity Test."

An important development in the TRIPs Agreement, detailed in Article (27/1), involves safeguarding the innovation process alongside the product itself. This stipulation ensures that if a company creates a drug through a particular process, no other entity is permitted to manufacture that same drug for a period of twenty years, with no exceptions made for those categorized as "essential drugs" by the World Health Organization. It is important to note, however, that patent regulations are applicable solely to products registered after January 1, 1995; thus, any drugs listed or traded prior to this date remain available in the public domain [15, 17].

In this regard, it is crucial to highlight compulsory licenses, which permit any WTO member that has accepted the TRIPs Agreement to utilize a patented invention without obtaining prior consent from the patent owner, whether by the government of the member nation or by designated entities, as long as [14, 18]:

- The length and extent of these patent applications are defined without requiring consent from the patent owner, relying on an analysis of the intended uses both prior to and following the issuance of the license.
- The member state can only utilize the compulsory license if it can prove that it was unable to secure a voluntary license under fair commercial conditions.
- The party utilizing the invention cannot transfer or assign the rights to these uses to others. According to Article 31 of the Agreement, adequate compensation must be provided to the patent holder for these uses, with the amount determined by the specific circumstances of each situation and its economic importance.
- The licensed product must primarily be provided to the domestic market of the country that receives the license, and the license should be canceled once the reasons for its issuance are no longer applicable.

Article 31 of the TRIPs Agreement outlines certain legal restrictions concerning compulsory licenses. Although the Doha Declaration from August 30, 2003, endorses the authority of each member state to issue and utilize compulsory licenses, particularly for the production of generic medications, numerous practical challenges persist that hinder most developing nations from reaping the benefits of this right. These challenges include intimidation from multinational pharmaceutical companies, which have largely obstructed the ability of many developing countries to produce generic drugs [15].

Considering the limitations imposed on pharmaceutical companies regarding the use of compulsory licenses, alongside worries that excessive use may diminish investments in research, development, and innovation, Article 31 offers advantages by promoting equitable competition in global markets and facilitating access to medications for underprivileged communities, all while guaranteeing just compensation for holders of intellectual property rights [13, 19]. In emergencies, the World Health Organization has advised the implementation of compulsory licenses to ensure the availability of affordable medicines, taking into account the intellectual property rights of patent owners, including provisions for compensation in such scenarios [2, 20].

5 Conclusion

This research underscores the substantial influence of digital transformation on the WTO, drawing attention to the notable opportunities and fresh challenges that the organization encounters in the digital era. Utilizing a descriptive-analytical approach, the study explored the WTO's reactions to these shifts and their implications for global trade policies and practices. Gaining insight into these transformations can improve the organization's capacity to adapt and innovate, thereby aiding its objectives of fostering free and sustainable trade in the face of continuous digital evolution.

5.1 Findings

The study concluded with the following results:

- The WTO has successfully met several of its fundamental aims, including the encouragement of international trade freedom and the enhancement of living standards in specific areas. Nonetheless, it has not completely fulfilled all of its objectives in every nation.
- The global trade environment has been enhanced by the WTO's core principles, including non-discrimination and transparency. However, there are still challenges in ensuring that these principles are applied fairly across both developed and developing nations.
- A disparity exists between the principles established by the WTO and their real-world application, especially for developing nations that may struggle to meet their commitments.

5.2 Recommendations

This study recommends the following:

- The WTO should increase the transparency of decision-making processes and strengthen cooperation between member countries to ensure a fair and balanced application of the rules.
- A comprehensive review of the WTO's organizational structure should be carried out to improve the effectiveness of its dispute settlement mechanisms, enabling better resolution of international disputes.
- Provide support and technical assistance to developing countries to help them meet their obligations and enhance their capacity to benefit more effectively from WTO obligations.
- Update WTO rules and policies to keep pace with global changes and new challenges in international trade.
- Promote the exchange of knowledge and experience among WTO member countries in order to increase mutual understanding and achieve mutual benefits.

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The Intersection of Technology and Stock Redemption: Legal Frameworks and Practices



Yasar Alhiniti and Dina Aljabari

Abstract This paper explores the legal framework of stock redemption with specific advancements in digital and technological management at its core by taking up a case that relates to private joint-stock companies. A comparison of legislation under The Companies Law is made with provisions under British statute law. The aim is to consider how enactments of stock redemption operate within distinct jurisdictions, in particular looking at the position with public authorities and boards of directors under the Companies Law compared with British legislation. It looks at under what condition shareholders can have their shares redeemed, including when public authorities' or board of director's approval is a necessary requirement. It also looks into the legal aspects concerning stock redemption and its impact on shareholders' rights, emphasizing digital means used for notification and payment. According to these findings, there are differences in legislators' protectionism on approaches to stock redemptions, which should be made known to shareholders. To solve these problems, the paper stresses the need to update the law by implanting clear digital procedures and terms for stock redemption and making the notification process more transparent. It also argues that companies should include in their statutes specific digital terms regarding stock redemption. This would create a more favorable legal atmosphere and help guarantee stability for shareholders as well as companies.

Keywords Stock redemption · Private joint-stock companies · Companies law · Shareholders' rights · Digital stock redemption procedures · Technological conditions · Governance · Transparency · Digital notification and payment

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1 Introduction

The process of redeeming stocks has a profound impact on the company, its shareholders, and its creditors, and it is not without its fair share of risks. To mitigate these risks, it is imperative to establish a comprehensive legal framework that outlines the necessary procedures and safeguards in case a redemption attempt fails. This framework should prioritize the protection of the rights of shareholders, creditors, and the company itself.

The redemption of stock is contingent upon meeting certain criteria that afford the company and its shareholders the privilege to initiate the repurchase of shares. These criteria must align with the best interests of both the company and its shareholders.

The regulations implemented in 2020 regarding the redemption of shares for private joint-stock companies offer a systematic framework for the redemption process, outlining the requirements, regulations, and steps involved, while also preserving specific provisions mentioned earlier. The significance of these regulations in effectively organizing the legal implications of share redemption has been appropriately highlighted by the Jordanian legislature. These consequences encompass the impact on the company and its capital, the shareholders of the redeemed shares, and the creditors of the company.

The following questions arise:

- Who has the right to request the redemption of shares?
- Who has the authority to approve the redemption of shares?
- What are the procedures for redeeming shares?
- What are the consequences of lacking a specific record or limit for the redemption payment?
- What are the legal effects of stock redemption on the company and the shareholders?
- Was the Jordanian legislator correct in not obligating the company to establish a special fund for redeemed shares?
- What are the legal consequences of stock redemption on the company's creditors?

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the legal framework related to the redemption of shares in private joint-stock companies under Jordanian law 2020.
- Investigate cases of share redemption based on the terms set out in the company's articles of association and bylaws, including shareholder deaths and redemption requests.
- Compare the Jordanian approach to share redemption with the UK approach, identifying differences and similarities in procedures and conditions.

- Assess the impact of share redemption on shareholder rights and the company, highlighting the practical and legal importance of specific procedures.
- Provide legal recommendations regarding the improvement and development of the legal framework related to the redemption of shares in private joint-stock companies.

1.2 Study Methodology

The analysis of stock redemption in private joint-stock companies, specifically in Jordan and Britain, is conducted through a descriptive-analytical approach in this study. In order to accomplish the goals of the study, data was gathered from pertinent company laws and regulations, and a thorough examination of legal literature and academic research was conducted. This comprehensive analysis aims to safeguard the rights of shareholders and promote fairness in legal proceedings.

2 Procedures for Redeemable Shares

The process of redeeming shares in a private joint-stock company is governed by a specific set of procedures outlined in the 2020 regulations. These procedures must be followed in order for the company to redeem its shares. The regulations stipulate that certain data pertaining to the share redemption process must be included in the company's bylaws, as detailed in Article (4/c/d/e) of the regulations, as follows:

- **Firstly:** The party with the authority to initiate the repurchase of shares, whether it be the company, the shareholder, or in accordance with the conditions outlined in the company's bylaws for share redemption [1, 2]. The company's bylaws must clearly designate the party entitled to request the redemption of shares, which may include the company itself or the redeemable shareholder. Alternatively, such a request may be triggered when specific conditions stipulated in the company's bylaws are satisfied.
- **Secondly:** The authority responsible for approving the redemption of shares from shareholders is determined by the company's bylaws. This entity, whether it be the general assembly, the board of directors, or both, must make the decision to approve the redemption request. In accordance with Article (6) of the regulations, the redemption decision must include specific information such as the name of the shareholder, the number of shares to be redeemed, and their total nominal value. It is important to note that a partial redemption is permissible, and the decision should also outline the conditions that necessitated the redemption of these shares.
- **Thirdly:** According to the regulations set forth in the company's bylaws, it is necessary for the selected address of shareholders with redeemable shares to be included in order to notify them about the decision to redeem their shares. This

requirement aligns with the 2020 regulations on redeemable shares for private joint-stock companies [3].

In this study, we will discuss the redemption of shares based on the company's request or under specific conditions.

3 Redemption of Shares Based on the Company's Request or Specific Conditions

The procedures for the redemption of shares are laid down in Article (68/b/1) of the Companies Law [4] and Article (4/c) of the 2020 regulations on redeemable shares for private joint-stock companies [5]. The request for redemption shall be initiated by the entitled entity under the bylaws of the company, which may include the company itself or the shareholder or in certain circumstances.

As stated in Article (7/a) of the regulations, the redemption of shares can be carried out either upon the company's request or under specific conditions, are as follows:

- **Firstly:** The redemption of redeemable shares requires a decision from either the general assembly of the company, the board of directors, or the general assembly's approval of a redemption request recommended by the board of directors. The entity specified in the company's bylaws must provide the necessary approval [6].
- **Secondly**: In order to approve the redemption of shares, the decision must encompass the specific conditions that necessitated the redemption, as outlined in the company's bylaws [7], whether issued by the general assembly or the board of directors.

The clarity of this matter becomes especially evident when the request for redemption is contingent upon fulfilling certain predetermined conditions. The company's contract and bylaws explicitly outline these conditions and scenarios. Of particular importance is the stipulation of a specific date for the redemption of the shares. This gives rise to the following inquiry:

- Is it permissible for the company, if its right to request redemption is stated, to refrain from exercising this right? Can the company abuse this right?

If a predetermined date for the redemption of shares is established, it can be contended that the company is obligated to redeem the shares by that date. The company does not have the option to choose whether or not to exercise its right to redeem shares, as this right is not absolute but rather restricted by the fulfillment of specific conditions outlined in the company's contract and bylaws, such as the inclusion of a redemption date. Furthermore, the company cannot misuse this right by redeeming shares prior to the designated redemption date. The company is required to adhere to the terms set forth in its contract and bylaws. However, if the company is not bound by a specific date, conditions, or circumstances for requesting redemption, it retains the discretion to exercise its right to request redemption or not. The researcher

supports the notion that the company is either bound by obligations or possesses the discretion to decide whether to make a redemption request. If a condition compels the company to request redemption based on a specific redemption date, it is obligated to do so, and refusing to comply would constitute a violation of the company's contract and bylaws. On the other hand, if the redemption request is discretionary, the company has the freedom to choose whether or not to exercise this right. The company is not obligated to repay the redeemable shareholders for the value of their shares unless the company is being liquidated [8]. In such cases, the company must initiate the redemption process, ensuring that it benefits the company and does not infringe upon the rights of shareholders or creditors [9]. The validity of the redemption condition is based on its ability to serve the company's interests [9]. The researcher discovers that in practice, most private joint-stock companies' contracts and bylaws, which include redeemable shares, limit the redemption process to specific conditions and scenarios, thereby obligating the company to request the redemption of these shares.

3.1 Redemption of Shares Based on Specific Conditions Defined in the Company's Contract and Bylaws

In the Case of the Death of a Shareholder Holding Redeemable Shares

Typically, in situations where there is a strong personal connection between a shareholder and the company, such as in professional or family businesses, the company has the authority to redeem shares. This is particularly relevant when a shareholder holding redeemable shares passes away, as it is important for the company to maintain the significant personal connection. Hence, it is common for the company's right to redeem shares upon the death of such a shareholder to be explicitly stated.

In accordance with Article (9/d) of the regulations, in the event of the death of the holder of redeemable shares, the shares are passed on to the heirs who possess the option to redeem them. If specified in the company's bylaws [2, 4, 10, 11], the heirs may also choose to receive the monetary value equivalent to the redeemable shares. This raises the following question:

- Is the company required to admit the heirs as shareholders upon the death of the shareholder holding redeemable shares, or is their right limited to the cash equivalent of the redeemable shares only?

Based on Article (68/a/1) of the Companies Law, which grants private joint-stock companies the authority to issue shares with specific rights, benefits, and priorities as outlined in the company's bylaws [4, 11], it is the researcher's belief that the company's bylaws can include a provision that prohibits the admission of heirs of a shareholder who holds redeemable shares after their demise. This restriction is justified by the unique nature of the company, which is closely tied to the personal qualifications of its shareholders, particularly in professional companies established

by individuals with specialized expertise. The shareholder's profession and specialization are crucial for their role within the company. Allowing the heirs to become shareholders without meeting the fundamental requirement of being qualified professionals would not be in the best interest of the company and would contradict its primary purpose. Consequently, the company has the right to specify in its bylaws that heirs are not permitted to become shareholders upon the death of the original shareholder, and the company will instead repurchase the shares.

Likewise, within family enterprises that depend on particular familial connections among shareholders, the inclusion of heirs may not align with the necessary family ties that form the foundation of the company. As a result, the shares are redeemed and the heirs are not granted entry into the company. In practice, numerous privately held corporations' agreements and regulations, which are officially recorded with the Companies Control Department, specify that shares are not transferred to heirs upon the shareholder's demise. Furthermore, the company may outline in its regulations that the heirs have the right to receive the monetary equivalent of the redeemable shares without being granted shareholder status [6, 12].

The contractual and regulatory provisions within the private joint-stock company dictate the dynamics between shareholders who possess redeemable shares and their successors. It is possible to establish an arrangement whereby these shares are passed on to the heirs upon the shareholder's demise, subject to the condition that the shares are encumbered by the right of redemption. Alternatively, an agreement can be reached wherein the heirs are not granted shareholder status but are entitled to receive , the monetary value equivalent to these redeemable shares [13–16].

Upon examining the second part of Article (9/d) in the regulations, which states that the heirs may receive the cash equivalent if the company's bylaws specify this provision, the researcher discovers that it is feasible for the heirs to become shareholders in the company after the death of the holder of redeemable shares, even if they do not receive the cash equivalent of these shares, unless otherwise stated in the company's bylaws. This contradicts the principles of fairness and redemption. Consequently, the researcher asserts that the admission of heirs as shareholders should be contingent upon their entitlement to the cash equivalent of these shares. Although Article (4/z) [4, 10, 17] of the regulations allows for the redemption of these shares with or without compensation, the automatic inclusion of heirs as shareholders does not align with the voluntary and consensual participation of original shareholders. The entry of a shareholder into the company is based on their consent and willingness, with the shares being redeemable without compensation. It is implausible to assume that the heirs would share the same willingness and consent as the original shareholder. The reason behind this is that if the heirs were to become shareholders by legal means, they would be held responsible for any liabilities or losses that the company may encounter. This goes against the principle of fairness. As a result, it would have been more appropriate for the Jordanian legislator to connect the inclusion of heirs as shareholders in the company with their entitlement to receive the monetary value of these shares [18–24].

Employee Shares

The company's objective in distributing these shares to its employees is to inspire them to enhance their productivity and elevate the standard of their work. By instilling in them a sense of ownership, they are motivated to approach their tasks with heightened professionalism and excellence, ultimately benefiting the company. Nevertheless, the company also prioritizes safeguarding its rights and interests, thus including provisions in its bylaws that necessitate the redemption of these shares in the event of the employee's departure or cessation of employment for any reason [25–30].

- The expulsion of a shareholder from a company is a necessary measure to safeguard the company's reputation and ensure its success in the labor market, especially when a criminal judgment is involved. This judgment can have detrimental effects on the company's image and continuity. In order to maintain its reputation and achieve its objectives in the labor market, the company may choose to redeem the shares held by the shareholder. Additionally, the company's contract and bylaws may include other conditions that are clearly and explicitly stated, as long as they do not violate public policy or moral standards. For example, the shareholder may be required to reach a certain age or lose legal capacity [31].
- The address where the shareholder is to receive notice relating to the redemption of his shares shall be with the shareholder [4, 10, 32]. It's a prescribed prerequisite and has to be incorporated into the company's bylaws [4, 33]. The company has 14 days following the date of approval of the redemption to notify a shareholder with redeemable shares about such approval, which can be adopted by referenda of the members of statutory bodies or by resolution of partner (shareholder) assembly/ meeting (General Meeting) or board of directors. The notification is sent by registered mail or delivery against receipt and acknowledgment, as well as in another manner provided for in this Act constituting a bond with copies certified by a notary public unless he is an employee and director so designated that he only signs. The address designated for shareholder notifications regarding the redemption of their shares must be communicated to the shareholder [6, 34].
- Where shares are to be redeemed for value, the company shall owe its shareholders by paying them in cash. The procedures for ascertaining the share value and the mode of payment has to be specifically provided in the by-laws of the company to obviate any doubt or uncertainty [4, 10, 35].
- Redemption of shares takes place without the need for any action by the holder of the redeemable shares when such conditions are fulfilled or at the option of the Company. The redemption shall be automatic upon satisfaction of these conditions, and whether or not to approve in redemption process is not taken into account [4, 10, 36].

To ensure fairness and avoid potential conflicts of interest, the company has to show that it fully compensated the shareholder for the redeemable share as per its bylaws. The lawmaker in tying the determination of the redeemable share price to this company's by-laws did a very prudent thing because it sets into place a transparent system for calculating and paying out the share price to the shareholder. This bars

any chance of the company setting whatever arbitrary price they choose, which could mean unfair treatment for the shareholder [12].

In the researcher's view, it is essential that any agreed-upon mechanism outlined in the company's by-laws be based on the actual value of redeemable shares. The legal definition of a share's true value is its proportionate part in the net assets of the company after deduction of any debts [6, 37]. The prescribed mechanism in the by-laws of the company has to dutifully mirror the true value of redeemable shares at the time when they are redeemed because this value can differ depending on when redemptions take place. This guards against a scenario where those being redeemed run the risk of having their redemption price decreased by the company under its authority [4, 10, 38].

In regards to the 2020 Regulations on Redeemable Shares for Private Joint-Stock Companies, the researcher highlights that the Jordanian legislator did not establish a specific limit or restriction on the consideration for redeemable shares. This absence of guidance raises concerns and will be thoroughly examined in subsequent discussions concerning the company's responsibility to compensate for redeemed shares [4, 10, 39].

4 Redemption of Shares at the Request of the Shareholder

As per the provisions stated in Article (7/b) of the 2020 Regulations on Redeemable Shares, shareholders who possess redeemable shares are entitled to request the company to redeem their shares. The decision to exercise this right lies entirely with the shareholder. They have the liberty to either request the redemption of their shares or choose not to do so, unless the company's contract and bylaws explicitly state that the shareholder must request the redemption of these shares on a predetermined date or upon fulfilling specific conditions outlined in the company's bylaws. The steps involved in the process of redeeming shares at the shareholder's request are as follows:

- **Firstly**: To initiate the process of redeeming their shares, shareholders are required to formally communicate their intention to the company. This can be done by sending a registered mail to the company's designated address or by following any other method specified in the company's bylaws [4, 10, 40]. The Jordanian legislator has implemented the same notification procedure for share redemption as that used for company-initiated redemptions. Furthermore, according to Article (67/b/2/Repeated) of the Jordanian Companies Law [4, 6, 41], it is mandatory for the company's contract and bylaws to include the company's address as an essential piece of information [35].
- **Secondly:** When a shareholder submits a request to redeem their shares, the company must carefully evaluate the request and render a decision to either accept or reject the redemption request. This decision can be made either by the general assembly or by the board of directors, as outlined in the company's bylaws. The

company has a maximum of 14 days from the date of receiving the shareholder's redemption request to make this decision. Subsequently, the company is obligated to inform the shareholder of its decision to approve the redemption within 7 days from the date the decision was reached. The notification can be sent to the shareholder via registered mail or any other method specified in the company's bylaws, to the address designated for receiving notifications, which must be explicitly stated as a fundamental requirement in the company's contract and bylaws [17, 42].

- **Thirdly**: In accordance with the company's bylaws, the company is obligated to compensate shareholders based on the determined value of their shares. This compensation must be calculated and distributed to the shareholder in a manner that is transparent and leaves no room for ambiguity [43]. It is worth noting that the Jordanian legislator has made a wise decision by mandating that this compensation mechanism be included in the company's bylaws, ensuring that it is agreed upon by the shareholders rather than solely determined by the company [6, 10, 44].
- **Fourthly**: The company is obligated to proceed with the redemption process once the redemption conditions are met, regardless of whether or not they are willing to accept or reject the shareholder's redemption request [45]. This raises the following question:
- If there are no available sources of funding for the redemption, is the company still required to proceed with the redemption?

As stated in Article (7/b/4) of the regulations, if funding sources cannot be found, the company must provide evidence of this through a letter from the company, along with a letter from its auditor. The Companies Regulatory Official will then allow the company a 30-day period to complete the redemption. Therefore, the company is obligated to carry out the redemption, even if it lacks funding sources (with the exception of funding from the company's capital) [6, 10, 46]. If the company fails to complete the redemption within the deadline set by the Companies Regulatory Official, the Official will issue a letter granting the shareholder the right to return the shares to the company and receive the agreed-upon amount as specified in the company's bylaws. The shareholder of the redeemable shares may then take legal action against the company in the appropriate court [25].

In contrast to the British legislator, the Jordanian legislator adopts a different approach when it comes to share redemption procedures. The UK Companies Act 2006, specifically Article (685), outlines the regulations for share redemption procedures in two specific scenarios:

- In the first scenario, the responsibility for redemption decisions lies with the board of directors of the company. The company's contract and bylaws should clearly outline the board's jurisdiction in making redemption decisions, establishing conditions, procedures, controls, and executing the redemption process.
- In the scenario of redemption decisions, the company's contract and bylaws hold authority. The redemption process, along with its conditions, procedures, and controls, is determined solely by the company's contract and bylaws, rather than the board of directors [26].

In accordance with Article (688) of the UK Companies Act, when redeemable shares are re-deemed, they are considered void and the company is required to decrease its capital by the nominal value of the redeemed shares [27]. This differs from the approach taken in Jordan, where Article (4/w) of the regulations states that redeemed shares are kept by the company, either reissued and sold or canceled, resulting in a reduction of the company's capital as outlined in Article (82/Repeated) of the Jordanian Companies Law [28].

5 Conclusion

The focus of this study is the importance of share redemption in corporate law, as it represents a balance between shareholder interests and those of the company. An analysis of the statutory provisions in Jordanian and English legal regimes reveals variations relating to the procedures and requirements for share redemption. This reinforces the need for a clearly defined legal framework that promotes fairness and protects the interests of each party. Results from this study reiterate that laws have to be updated and revised to meet changes resulting from economic activities to ensure steadiness and create an effective environment where corporations and shareholders benefit.

5.1 Results

The study reached the following results:

- Upon analyzing the legal frameworks, it was discovered that Jordanian law includes provisions for share redemption in certain circumstances, thereby offering protection to both companies and shareholders.
- When examining the approaches of both Jordan and Britain, notable disparities in procedures and conditions emerged, particularly in the British approach which placed a higher emphasis on the need for precise legal texts pertaining to share redemption.
- The significance of share redemption in ensuring company stability and protecting shareholder rights is particularly notable, particularly in professional and family-owned companies where the personal connection of shareholders holds great importance.
- The implementation of a mechanism for shareholder notification and information sharing, as mandated by Jordanian law, serves as a crucial factor in promoting transparency and mitigating potential conflicts.

5.2 Recommendations

Based on the results obtained, the study recommends the following:

- Updating legal regulations with more detailed provisions regarding the procedure and conditions for the redemption of shares, ensuring a balance between the rights of shareholders and companies.
- Increasing the transparency of shareholder notification and communication mechanisms regarding redemption decisions and establishing clear procedures for calculating and paying the value of redeemed shares.
- Developing a legal framework with provisions to protect the rights of heirs in the event of shareholder death and avoid multiple interpretations of legal texts.
- Encouraging companies to include clear provisions in their regulations regarding the redemption of shares, adapted to the nature and activities of the company.
- Conducting continuous comparative research between local and international regulations to improve and develop the legal framework for share redemption, ensuring compliance with best practices.

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Reconciliation Provisions in Customs Crimes: A Comparative Study with Technological Integration



Mohammad Hussain Al-Ahmad and Suhayb Emad Al-Maaytah

Abstract Reconciliation is a well-known concept in civil cases, but its implementation in criminal cases is more complicated. This is because the state serves as a representative of the public interest. Indeed; Article 30 of the Code of Criminal Procedure regulates the implementation of reconciliation in criminal cases. It states that criminal charges against the perpetrator cannot be withdrawn, except for legal and justified reasons. Reconciliation does not apply to all crimes. In many criminal cases, the prosecutor's office has the right to withdraw charges without obtaining the consent of the victim or injured party. In some countries, the law states that the sentencing judge has the power to dismiss the case without the consent of the victim or injured party. This case applies to a crime violating morals, as it has characteristic features that distinguish it from other crimes, which is why the perpetrator can negotiate with the officer to discontinue the criminal proceedings. The purpose of this research paper is to examine the provisions, conditions and effects of customs crime reconciliation. It also aims to examine the advantages and disadvantages of reconciliation compared to other countries that have regulated reconciliation in their customs offenses laws.

Keywords Reconciliation · Legislation · Customs crimes · Code of criminal procedure · Technology

1 Introduction

The evasion of fees and taxes owed to the state's treasury can be classified as customs crimes, which fall under the larger category of economic offenses [1]. Given their unique characteristics, the legislator took inspiration from comparative legislation

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and established a dedicated reconciliation system for individuals engaged in smuggling [2, 3]. The purpose of this mechanism is to enable individuals to reach an agreement with the competent authority and avoid the consequences of criminal prosecution and public prosecution altogether [4, 5]. If the agreements are approved, criminal prosecution will be put on hold and the public prosecution will be dropped. As part of addressing customs crimes, a reconciliation system requires the perpetrators to make joint and several payments of fines specified by the Customs Law [6]. The reconciliation is an interesting legal mechanism that has yet to be fully integrated into the country's Penal Code or Code of Criminal Procedure. Currently, it only applies to customs offenses, setting it apart from other legal frameworks. The purpose of this study is to explore both the advantages and disadvantages of using this particular reconciliation system [7]. By performing a thorough comparison with international legislations that have adopted similar approaches, the effectiveness, as well as limitations, of the model in handling customs offenses will be analyzed comprehensively [8]. Exploring how to solve customs-related offenses and evaluate them nationally and internationally is the primary purpose of this analysis [9]. These matters will be up for ongoing discussions where valuable insights can be contributed [10, 11].

We delve deeply into the intricate system designed to combat customs smuggling crimes to gain a comprehensive understanding [12]. We apply descriptive and analytical techniques to uncover the minute details of this system. Our focus is to reveal the concealed mechanisms and specifics of this structure [13]. Moreover, a comparative analysis of global and local laws was conducted. Our distinct perspective offers a new explanation of Jordan's reconciliation system and its link to customs-related offenses, with similarities to legal frameworks worldwide [14]. Through comparison and the use of descriptive and analytical approaches, we intend to thoroughly evaluate the system in use. Our objective is to understand the nature, effectiveness, and provisions of the system and measure its compatibility with legal frameworks both nationally and internationally. Having done so, impactful strides can be made in the ongoing conversation about the management and adjudication of customs smuggling offenses.

1.1 Research Problem

There is a debate among scholars regarding the ability of the legal system to reconcile disputes effectively. Lawmakers made their choice to limit its usage to customs offenses, rather than integrating it into the Code of Criminal Procedure or the Penal Code. However, due to its limited and unique application, questions are posed regarding its practicality and whether its terms are effective at preventing both specific and general offenses. This has led to questions about the impact of restricting the reconciliation system to customs crimes and its wider consequences. Through our research, we delve into a narrow category of transgressions to fully examine the intricacies of a system and assess its effectiveness in deterring criminal activity. We

zoom in on the framework of criminal liability for customs smuggling offenses and scrutinize the workings of the system, with the aim of understanding its potential impact on preventing both repeat and future offenders. Researchers are particularly intrigued with the reconciliation system's unique legal treatment, and are exploring its complexities to provide a fresh, nuanced perspective on its advantages and disadvantages, and how it intersects with customs offense deterrence and legal processes. Ultimately, this will enrich discussions in this field. The following questions stem from this research problem:

1 What is the nature of the reconciliation system concerning customs crimes?
2 Does the reconciliation system for customs crimes have specific conditions for its conclusion?
3 What is the impact of entering into reconciliation agreements on customs smuggling crimes?

1.2 Research Significance

The complexity surrounding the reconciliation system tailored for customs crimes is the main focus of this study. This is particularly significant since there is no such system for other criminal offenses listed in the Penal Code. The lack of prior research in this specific area highlights the innovative and pertinent nature of this investigation. The intricacies of the reconciliation system applied to customs crimes require examination to gain a better understanding of its nature and potential consequences. Our research aims to fill a critical knowledge gap in this area. We recognize the unique nature of this system, made clear by its Eastern implementation and exclusion from broader criminal offenses in the Penal Code, emphasizing the need for comprehensive investigation. This investigation delves into the mysterious process of the reconciliation system by examining its foundational principles, operational variables, and effects on those responsible for customs misdemeanors. This study stands out due to the rare focus on Jordan's customs crimes and reconciliation systems. By analyzing this relatively unexplored domain, valuable revelations emerge. As such, this research holds weight as a noteworthy addition to academic literature. The distinctive outlook of this probe also accentuates the practical implications of our findings, emphasizing its novelty and significance. Presented here is a resourceful nature that establishes a foundation for future scholarly work and policymaking, ripe for research and exploration. An introduction to the potential impact of implementing a specialized reconciliation system in a customs offense context is also offered, providing a nuanced understanding of the context's dynamics.

1.3 Research Objective

Analyzing the intricate details of the customs smuggling reconciliation agreement framework is the main objective of this research. It encompasses a comprehensive exploration of the reconciliation system's clauses and conditions, particularly its operational dynamics within the Customs Law. Moreover, the study employs a comparative perspective, with the intention of juxtaposing Jordan's system with similar mechanisms in both domestic and international laws. These multifaceted objectives ensure that the entire breadth of the topic is explored during the investigation. This comparative analysis seeks to develop a detailed comprehension of the exclusive traits and potential room for progress in the legal scheme. Its main purpose is to draw resemblances, emphasize differences, and provide input on contrasting worldwide methodologies used to resolve contraband smuggling violations. The ultimate objective of this inquiry is to assess the efficiency of the reconciliation system as a counteractive measure against such crimes. As a result, this study makes a valuable contribution to the extensive expanse of global lawful structures. In customs law context, the efficacy of the reconciliation system utilized for crimes related to smuggling is presently under scrutiny. The system's ability to efficiently resolve cases while simultaneously deterring illegal activities and contributing to law enforcement objectives is being evaluated through research. With the aim of acquiring a comprehensive framework for a deeper comprehension of the system within the legal landscape, objectives are centered on comparative analysis for cross-jurisdictional insights. Ultimately, valuable outcomes and implications are sought to be extracted.

1.4 Research Methodology

Utilizing a multifaceted research methodology is necessary in addressing the subject matter. Our study shall make use of a varied blend comprising analytical, comparative, and descriptive approaches to delve into the complex nature of the customs smuggling reconciliation system. We shall conduct a comprehensive review of legal texts, scrutinize relevant case law, and make comparative assessments of legislative frameworks across Algeria, Egypt, and Jordan. Our descriptive strategy involves meticulous documentation and analysis of specific provisions encompassed within the legal texts related to the customs smuggling reconciliation system. By examining its procedural intricacies, operational conditions, and other pertinent details, we can gain a complete understanding of the internal workings of the Jordanian Customs Law. Through the use of our analytical methodology, we critically examine any nuances, potential vagueness, and implications present in the legal language related to the reconciliation system, after analyzing the legal provisions identified during the descriptive phase. Ultimately, the objective is to gain valuable insights into both the practical application and functioning of the system. The analysis in this research goes beyond just Jordanian legislation by taking a comparative approach. Specialized

courts operating under the Jordanian legal system are scrutinized in order to make contextual conclusions regarding the utilization of the reconciliation system. Furthermore, by including Egyptian and Algerian legislations in a comparative assessment, this study sheds light on the diverse approaches of different jurisdictions towards the reconciliation of customs smuggling crimes [15]. This unique lens gives the research richer insights by identifying possible best practices and crucial variations that can contribute to the evaluation of the Jordanian system.

2 Reconciliation Provisions in Customs Smuggling Offenses

The dismissal of civil suits through mutual agreement between the plaintiff and defendant is known as reconciliation. This also results in the expiration of the lawsuit. The Civil Law No. 43 of 1976 describes reconciliation as a contract that settles disputes and resolves enmity between the parties. On the other hand, public prosecutors are limited in their authority to dismiss or abandon criminal lawsuits without legal grounds [1], (p. 288).

The inclusion of a reconciliation system in criminal offenses pertaining to customs, tax, and economic crimes is permissible in some comparative legislations, including that of Jordan. Upon the establishment of a reconciliation agreement, the criminal lawsuit ceases to be valid and judicial prosecution comes to a halt [13, 14]. The incorporation of such a system in legislation has been justified by their lawmakers as a means to restore embezzled funds, alleviate the negative impact of the crime, and thwart the offender from achieving their objective [1, 11, 16].

Let us delve into the significance of the reconciliation system as a catalyst for the cessation of customs lawsuits and criminal prosecution [17]. Our aim is to detail the provisions of the Customs Law regarding the reconciliation system. Furthermore, we will draw comparisons between this system and similar provisions from both national legislations and international comparative legislations, with particular emphasis on Egypt and Algeria [18–21]. We will divide this section into two parts—the first will deal with explaining the nature of the reconciliation system for customs smuggling offenses, while the second shall appraise the reconciliation system for customs crimes by juxtaposing it with that of other Jordanian legislation that encompasses such a system, as well as with the international legislations in Algeria and Egypt.

2.1 The Nature of the Reconciliation System for Customs Smuggling Offenses

Unlike other legal doctrines that provide rich references defining the judicial reconciliation system and elucidating its provisions, there is no explicit definition of the customs reconciliation system in the Customs Law No. 20 of 1998, its amendments,

the Code of Criminal Procedure No. 32 of 2017, the specialized customs courts, or the Court of Cassation. The legal doctrine has not extensively addressed or defined customs reconciliation or delved into its provisions [2, 21], (p. 117).

A definition of customs judicial reconciliation by legal scholars states it is an agreement made between officials involved in smuggling and the Minister of Finance or his representative. This agreement must be entered into before issuing a final judgement and results in the suspension of prosecution and the dismissal of the case. Another viewpoint by legal scholars describes it as a written document that acknowledges the debt and settles disputes between the Customs Department and the perpetrator of smuggling crimes, showing concessions made by both parties [3] (p. 179); [2, 22], (p. 120).

In the category of smuggling offenses, a custom reconciliation deal is a contractual agreement established between smugglers and the Minister of Finance or his delegate. The accord, decided upon prior to the rendering of a definite verdict, induces shared liability for fees on the part of the implicated smugglers [23]. Its benefits include dispute resolution, the sundering of public prosecution and the put on hold of criminal case proceedings [24].

This sub-section is being split in two due to the array of viewpoints. One branch will delve into the Customs Law's take on reconciliation systems, and the other will scrutinize how comparative legislations interpret it.

2.2 The Nature of the Reconciliation System for Customs Smuggling Offenses According to the Customs Law

Taking a closer look at the Customs Law No. 20 of 1998, including Articles 212 and 213, it becomes evident that settling customs offenses is favored by the legal system for the purpose of dropping public suits and halting criminal prosecution. The law allows the Minister of Finance or their delegate to negotiate a reconciliation for customs smuggling crimes and analogous offenses, though only during certain defined periods, such as before, during, or prior to the final verdict. Before a case of smuggling goes into public litigation or reaches a final judgment, the offender may choose to request reconciliation with customs authorities. This is also an option for all officials implicated in the crime who haven't yet received a final verdict. However, it is important to note that settling for smuggling crimes is not mandatory for the Minister of Finance or their representative, according to Article 212. The wording of the article clarifies that the minister or delegate can settle but isn't required to. The reconciliation guide requires immediate compensation for fines and fees outlined in Article 213 of the law. The use of phrases such as "the minister must" or "the minister shall" would imply an obligation to comply. Essentially, the agreement's impact and judgment depend on the timely payment of applicable dues.

Amidst the discourse surrounding the Customs Law, some legal experts have voiced skepticism about the effectiveness of its current reconciliation process in

achieving deterrence [4], (p. 75). Detractors contend that this system enables wrongdoers to sidestep public prosecution and court hearings, with the simple act of signing an agreement and paying fines, rather than facing heftier consequences, like jail time. Such critics position that this methodology contradicts a fundamental principle of the justice system; namely, that without explicit legal standings, crimes cannot be committed, and punishments cannot be invoked. The implication of non-criminalization of an action is that it is acceptable [5], (p. 13). To combat this, the legislation might require revisions within the Customs Law reconciliation provisions to render them more stringent. Alternatives such as increasing the penalties for repeat smuggling offences, disallowing reconciliation for those who continue to commit crimes, or restricting reconciliation to particular goods while prohibiting others, including high-duty or prohibited goods, might be considered by the lawmakers [6]

Concluding a reconciliation agreement for customs offenses has significant effects, including expiration of the criminal lawsuit and cessation of criminal prosecution. Should a final judgment not be obtained prior to the reconciliation agreement, confiscated goods and means of transport will be returned in accordance with Article 214 of the current Customs Law and the provisions and conditions thereof [4], (p. 78).

2.3 The Nature of the Reconciliation System According to Comparative Legislation

Similar to the approach taken by the legislator, customs crimes in Egypt and Algeria are addressed through a reconciliation system, but with differences in the specific provisions of each legislation. In the following discussion, we will delve into how both the Algerian and Egyptian legislatures have embraced this system, as well as the unique characteristics of each.

- **Firstly: The Egyptian Legislature's Stance on the Customs Reconciliation System:**

Similar to the legislator, the reconciliation system for customs crimes has been adopted by the Egyptian legislator under the effective Egyptian Customs Law's Article 76, as evidenced in Case No. 1664/78 of the Egyptian Cassation Court. Although the nature of the customs smuggling reconciliation agreement and its effects align the Egyptian legislature's stance with Jordan's, the disparity between the two laws is the amount of fines required for reconciliation.

- **Secondly: The Algerian Legislature's Stance on the Customs Reconciliation System:**

In line with the legislative actions taken by Jordan and Egypt, Algeria has opted for a reconciliation-based approach for addressing customs smuggling offenses, as stipulated in customs legislation. However, unlike its counterparts, Algerian lawmakers have excluded the possibility of settling certain smuggling crimes pertaining to

substances under subsidy, arms, ammunition, drugs, and other prohibited items from their legal framework [7]. The rationale behind this move is to address the negative impact of smuggling on the country's welfare, security, and public health. It should be noted that Jordan and Egypt did not adopt such measures and allowed customs reconciliation for all smuggled goods.

3 Evaluation of the Customs Smuggling Reconciliation System

In legal circles, there is an ongoing debate about whether reconciliations should be allowed for customs crimes, particularly economic ones. Those who support this position argue that as long as the offender isn't a repeat offender or previously convicted of an economic crime, it should be permitted [8], (p. 241). However, others contend that fines and financial agreements resulting from reconciliations for these types of crimes can actually hurt the country's economy. It is believed that if these crimes were prevented and combated, it would provide a greater benefit to increasing the country's financial resources. [9], (p. 264). We will divide the claim into two branches, using the Customs Law as a basis for our assessment. However, we'll also compare the reconciliation system between the Customs Law and the Economic Crimes Law in a second branch.

3.1 Assessment of the Reconciliation System According to the Customs Law

By examining the amendments made to the Customs Law No. 20 of 1998, researchers have uncovered that there is no explicit clause preventing a smuggler from making a reconciliation agreement for repeat offenses, nor does the law stipulate any increase in fines in such cases. This suggests that perpetrators of smuggling are in fact allowed to reconcile every time they commit the crime under the provisions of the Customs Law. Under Law No. 20 of 1998 and its alterations, the Customs Court doesn't usually enforce imprisonment for repeated customs smuggling crimes, though the legislator has made it mandatory for repeat offenders to be imprisoned. This situation is worth highlighting. In fact, it is quite odd. The Customs Law of 1998 doesn't generally impose a prison sentence for repeat offenders, yet it exists as a penalty in the legal system.

The legislator's approach to customs smuggling offenses has faced criticism from researchers. Their suggestion is to limit reconciliation for repeat offenders and to also consider imposing imprisonment for deterrence. This approach would help combat the detrimental effects on the national economy and society as a whole. The legislator should take another look at the fact that customs smugglers are well aware that

they won't be imprisoned for repeating the offense, nor will they be denied the opportunity to sign a reconciliation agreement or see an increase in fines, no matter how many times they engage in such activity. It is an important aspect that needs to be reconsidered.

3.2 A Comparison of the Reconciliation System Between the Customs Law and the Economic Crimes Law

Under comparative legislation, Article 9 of the Economic Crimes Law No. 11 of 1993 and the revised Law No. 20 of 2004 dictate the reconciliation system as "the Public Prosecutor may reconcile with anyone who commits a punishable crime outlined in this law (1). Those who return all funds gained from their crime or settle them in full can have their prosecution suspended. Approval from a judicial committee headed by the President of the Public Prosecution, along with a Court of Cassation judge appointed by the President of the Judicial Council and the Civil Attorney General, is mandatory for any decision made by the Public Prosecutor during an investigation or trial. The Public Prosecutor's viewpoint must also be taken into account. (2) However, this rule does not extend to civil servants operating in administrative, municipal, or judicial positions, employees of security or military organizations, or any related personnel working in a public administration or organizational setting.

A difference is observable after scrutinizing the aforementioned piece, in regards to the regulations concerning reconciliation outlined in the Customs Law and the Economic Crimes Law. The most notable differences for the purpose of comparison can be summarized as follows:

Authority Granted by the Legislator to Conduct Reconciliation

The guilty parties in a smuggling offense settle with the Minister of Finance or their authorized representative in cases of customs crimes. The administration under the Minister of Finance or their appointed official, like the Director-General of Customs, is responsible for overseeing and approving the reconciliation agreement. The Economic Crimes Law notes that the parties responsible for settling economic crimes consist of the perpetrator or holder of the funds involved and the Public Prosecutor [24]. Interestingly, the Public Prosecutor holds jurisdiction for reconciliation in this realm, as opposed to customs crimes which are under the care of administrative bodies like the Ministry of Finance. This was established in 1993.

Timing of Reconciliation

Before the final judicial verdict is issued, under the Customs Law, reconciliation occurs beforehand, but in the Economic Crimes Law, it can occur at any point in the investigation or trial except for after a final verdict. Consequently, both laws are similar in this way [1], (p. 292).

Conditions for Reconciliation

The law concerning Customs is effective, but it doesn't specify much about the reconciliation contract. However, it does mandate that reconciliations must be made before a final judicial verdict is issued. The authority under which reconciliations are accepted lies with the Minister of Finance or someone representing them. Alternatively, the Economic Crimes Law specifies certain conditions for settling cases. These include paying back all of the money or coming to a mutually beneficial reconciliation, getting approval from the competent judicial committee, and having a reconciler from a non-exempt category, such as public employees or those holding administrative, judicial, or military positions [1], (p. 292).

Impact of Reconciliation

Reconciliation has a similar effect on customs and economic crimes—it ceases judicial pursuit and dismisses public prosecution [10], (p. 150). One aspect of punishment is that all offenders should receive an equal penalty for the crime according to the law.

4 Conclusion

It is apparent that the parliament has taken a different approach in handling customs and economic crimes compared to other types of criminal activities. The primary objective of implementing this system is to recuperate lost funds and protect the economy of the state. In essence, this offers a way to suspend legal action against individuals responsible for smuggling offenses and eliminate public prosecution. Similar to Egypt and Algeria, Jordan has instituted a reconciliation system for customs violations, but there are variations in the fines and terms specified in each law. The Jordanian Customs Law and the Economic Crimes Law have distinct reconciliation procedures—we've outlined their discrepancies and parallels. In our examination, we discovered the Customs Law to be better aligned with the essence of reconciliations, as it refrains from outlining specific reconciliation conditions and exempting certain persons from the process. This upholds reconciliations' objective of recouping evaded finances and circumventing protracted lawful proceedings. Customs smuggling offenders must face stricter consequences under an amended customs reconciliation system. Improved stringency is necessary for enhancing the fight against financial loss to the treasury from fees and fines, as well as achieving both general and specific deterrence.

4.1 Results

1. Issuance of a final judgment from the court is the only instance where a reconciliation contract for customs smuggling crimes cannot be concluded as set by the legislation.
2 Halting criminal pursuit and dropping public prosecution are the outcomes of settling a customs crime agreement.

4.2 Recommendations

1. To intensify the battle against customs smuggling, the team of researchers suggests that the legal system adjust its reconciliation regulations for such offenses. Specifically, the researchers recommend that repeat offenders face higher fines or be prohibited from reconciling. Goals include boosting general and specific deterrence and enhancing overall enforcement efforts.
2 Prohibiting customs reconciliation for those who commit customs smuggling crimes must be put in place by authorities, particularly for prohibited or specifically prohibited smuggled goods. It is essential to protect the health and safety of society from possible dangers these goods carry. As suggested by researchers, this should be prioritized to address smuggling issues effectively.

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The Role of Technology in Validating Arbitration Awards and Enhancing Commercial Security



Mohammad Mahmoud Aldaoud, S. El-Manaseer, Dema Matruk Aloun, Mohammad Basheer Arabyat, and Mohammad Ali Alsarhed

Abstract This study examines various aspects of the validity of an arbitration award and its enforceability in different legal contexts, with particular emphasis on the role of technology in this context. Generally, in many jurisdictions, to enforce an arbitration award, you must obtain a court order because the award itself is not enforceable. This study used a descriptive approach to analyze the texts of different legal arbitration laws and a comparative method to read the differences between some legal systems in terms of the validity of an arbitration award and the necessary steps to enforce it. This study covers all the aspects and phases that need to be gone through to ensure that an arbitral award is enforceable in order to prove its legal effects and how this can be facilitated through technology.

Keywords Arbitration awards · Commercial security · Technology · Comparative method

1 Introduction

With the dynamism of the global trade market and the increase and decrease of direct foreign trade injection, coupled with the continuous escalation of interpersonal, corporate and national conflicts, arbitral awards have become the main way to resolve

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such disputes. This article explores the importance of arbitral awards in enhancing the security of international trade. This article focuses specifically on arbitration and its effectiveness in dispute resolution, as rapid decision-making in a highly politicized environment outside the country's traditional legal system can significantly shorten the duration of a dispute by building a high level of trust between the disputing parties. A controlling feature of arbitration is its increased confidentiality, which is a natural feature of the nature of arbitration in resolving commercial disputes. It guarantees the confidentiality of the injured party's reputation and proprietary business information, ultimately improving the overall security of international business transactions: the confidentiality of the arbitration process helps speed up the entire dispute resolution process and maintains the business integrity and privacy of the parties. Interested parties. Together, these two factors enhance mutual trust in international trade transactions. For example, in addition to protecting private information, a safe space for arbitration protects reputational capital. In court, parties must defend their public reputations and may face some stigma as a result of the lawsuit. Arbitration, by contrast, resolves conflicts behind closed doors, a feature that, like privacy, protects parties by eliminating the risk of the litigation being viewed negatively by the media.

1.1 Problem Statement

The second type of challenge concerns the impact of deviations from national legislative rules on the enforcement and recognition of commercial arbitration awards, which necessarily requires more complex research into the validity of arbitral awards. This challenge poses a significant obstacle to the general issue of cross-border commercial security, and differences between national laws can lead to difficulties in the enforcement of arbitral awards and pose obstacles to the effectiveness of such dispute resolution. The variability of national legislation creates a problem: the enforcement or recognition of arbitral awards is sometimes blocked due to different legal frameworks applicable in different jurisdictions. Will this affect the uniformity and consistency of the enforcement process and ultimately the quality of arbitral awards in a transnational context? The diversity of national legislation raises serious issues that need to be addressed in order to enhance the reputation and usefulness of arbitration in the international market. When arbitral awards are hampered by the intersection of different laws, the lack of clarity can undermine cross-border trade security itself and undermine parties' willingness to enter into cross-border commercial relationships. If there is uncertainty as to whether an arbitral award should be enforced or recognized abroad, parties may lack the necessary institutional framework to build the trust that is critical to international commercial relationships. It is necessary to have an ongoing, nuanced understanding of applicable global principles and legal systems in many different jurisdictions around the world. This will hopefully lead to some harmonization or at least harmonization of processes and procedures, making the enforcement of arbitral awards in different jurisdictions less complex.

1.2 Study Objectives

1. Analyze the mechanism of arbitration: Understand how the arbitration process works, what factors contribute to the validity of its awards, and what effective means are used to ensure enforcement.
2. Assessing time efficiency: Examining the extent to which arbitration resolves disputes more efficiently and quickly than traditional litigation and how this can help improve business security.
3. Analyze the reputational impact: Examine how arbitration decisions (particularly in relation to the protection of business information) affect the reputation of the disputing parties.
4. Exploring the impact on expectations: Explore how dispute resolution can raise the expectations of individuals and businesses about their rights and responsibilities, thereby increasing business certainty.
5. Analyze the economic impact: Understanding how arbitration affects economic activity and investment can help create a safer trade and investment environment.

1.3 Significance of the Study

Therefore, the main contribution is to emphasize the significant contribution of arbitral awards to the business environment and economic development, especially the importance of the validity and enforceability of arbitral awards. Ultimately, this study aims to demonstrate the potential contribution of arbitral awards to the economy. This study is therefore expected to provide a roadmap on how arbitration contributes to and benefits from a sound business environment in complex ways and how its efficiency and speed in dispute resolution can help mitigate uncertainty and create appropriate business environment. The aim of the project is to break down the boundaries between arbitration and a good business environment and provide a roadmap for how players in the field can make more informed decisions about using arbitration as a dispute resolution tool. Furthermore, studying the interaction between the use of arbitration and increased investment activity promises to be a valuable contribution to the broader economic development debate. Avoiding disputes and favoring arbitration not only reduces risk; They also help to enhance investor confidence, thereby serving as a solid pillar for increased investment flows, which in turn serve as the engine for a virtuous cycle of sustainable and lasting economic growth, an environment in which effective arbitration can play a fundamental role.

1.4 Methodology

The study adopts a descriptive approach to examine in detail the legal framework for arbitration in Jordan and Egypt. The analytical approach using a descriptive approach

aims at scrutinizing the wording of the two arbitration laws, allowing us to deal with complex texts, providing us with a wealth of information embedded in the legal texts and helping to address the guiding principles of the legal framework. Validity and enforceability of arbitration awards based in Jordan and Egypt. Furthermore, the work will be comparative: the differences and similarities between Jordanian and Egyptian legislation regarding the validity and enforcement of arbitral awards will be examined through the methodological lens of informed choice. The comparative approach used in this work serves as a guide and highlights the different legal paths taken by each jurisdiction. The comparison of Jordanian and Egyptian law is intended to highlight differences or similarities that may arise and to provide a clear and careful perspective on the complexities of arbitral awards. The main purpose of this comparative approach is to identify nuances that help explain why and under what conditions an arbitral award is enforceable, i.e. how it acquires legal effect. In this way, the study of legal texts becomes interpretive research and ultimately yields insights relevant to arbitration debates. The study identifies the limits on the enforceability of arbitral awards by highlighting the formal (or informal or super-formal) differences or similarities that can render an arbitral award enforceable (and therefore legally enforceable).

2 Types of Commercial Arbitration Awards

In order to explain the types of commercial arbitration awards, it is first necessary to emphasize the connection between commercial arbitration and commercial disputes.

2.1 Commercial Arbitration

Pursuant to Article 11 of the Egyptian Arbitration Law, the law permits recourse to arbitration to resolve disputes where arbitration is possible. Likewise, the Jordanian legislature has adopted this approach under Article 9 of the Jordanian Arbitration Law of 2001 and its amendments. Most disputes that are resolved by law are matters that allow for settlement. Therefore, given that the majority of cases submitted to arbitration are commercial in nature, arbitration is a viable method of resolving these commercial disputes [1]. Arbitration legislation in this area focuses more on the commercial aspects. This is clear from the title of the Act, which deals with civil and commercial arbitration. Furthermore, Egyptian law specifically regulates commercial issues in Article 2. The legislature therefore prioritized the resolution of commercial disputes through arbitration to reconcile the principles of trade (trust and speed) with the principles of arbitration (speed, reduced costs and reduced effort). Egyptian legislation defines commercial arbitration more clearly than the Jordanian Arbitration Law, which mentions this in Article 3.

2.2 Types of Arbitration Awards

The circumstances giving rise to an arbitral award vary. During the arbitration process, multiple judgments are rendered before a final decision is made. The situation after the final award is issued varies from arbitration to arbitration. Therefore, the types of arbitral awards can be classified according to the different legal and factual circumstances in which they are made:

1. **National and Foreign Arbitration Awards**: Arbitration may result in national or domestic awards, ranging from an arbitration agreement to the issuance of an award in a country. If the award is awarded in another country, it is called a foreign award. In addition, there is a type of adjudication called international adjudication, which is related to international trade and governed by international agreements [2].
2. **In-Person and Absentia Arbitration Awards**: The arbitrator may make an award in the presence or absence of the parties to the arbitration dispute. The absence of one or both parties to the dispute does not prevent the arbitrator from making an award [3]. If a decision is appealed in absentia, both parties will be notified, and upon receipt of the notice, the period to challenge the decision begins. The Egyptian Legislature obliges the arbitrator under Article 24 to deliver a signed copy of the award within thirty days of its issuance. The Jordanian legislature has also stipulated this in Article 42/A [4].
3. **Partial and Complete Arbitration Awards**: An arbitral award may be partial (relating to a particular aspect of the dispute) or complete (relating to the dispute as a whole). The arbitrator may make a partial award during the arbitration process. After the final award is made, the situation changes from partial arbitration to full arbitration. Egyptian and Jordanian legislation allow for the issuance of partial awards in Articles 42 and 40 respectively.
4. **Final and Interim Arbitration Awards**: As part of the arbitration proceedings, certain formalities and procedures are required. The arbitrator may issue interim awards on certain procedural matters (such as the arrangements for meetings or the appointment of experts). These rulings are not final and conclusive on the substance of the dispute. However, once a final award is issued, the judgment becomes final and conclusive and determines its validity. Arbitration awards based on settlement and settlement are considered final as they resolve and resolve the dispute. In addition, there may be arbitral awards that decide certain applications and others, and these awards are also considered final and conclusive judgments [5]. Examples of non-conclusive awards include the Egyptian legislature's statement in Article 36/A: "The arbitral tribunal may appoint one or more experts…" and the Jordanian legislation's statement in Article 28/B: "The arbitral tribunal may Decisions made by experts in whole or in part where written documents are accompanied by Arabic translations…"
5. **Additional Arbitration Award**: Such arbitration award shall be final, however, the document was not issued on the scheduled date of arbitration. This occurs when the court fails to rule on all applications submitted to it. The parties may

apply for the award after the expiration of the arbitration period [6]. The Egyptian Legislature stipulates in Article 51/1: "Even after the expiration of the arbitration period, the parties to the arbitration may apply to the arbitral tribunal for another arbitration award within thirty days after receiving the arbitration award." This is also the case with Article 47/A of the Jordanian legislation.

6. **Interpretative Arbitration Award**: Arbitral awards can be made but may be ambiguous, giving rise to disputes between the parties to the arbitration. The dispute can only be resolved by the parties requesting the arbitral tribunal to issue an interpretive award. The interpreted price is considered part of the original price [7]. The Egyptian Legislature elaborates on this in Article 49/1: "Each party to the arbitration may, within thirty days of receipt of the award, request the arbitral tribunal to explain any ambiguities in its wording." Jordanian Legislature No. This is also discussed in Article 45/A.
7. **Corrective Arbitration Award**: After the arbitral tribunal renders its award, there may be material errors. The error may be corrected by further award of the arbitral tribunal or at the request of the parties. The Egyptian Legislature provides for this in Article 50/1, and the Jordanian Legislature has a similar provision in Article 46/A.
8. **Urgent Arbitration Award**: The issuance of a final award requires sufficient time to submit applications, hear witnesses, review documents and consider expert reports. Due to the nature of certain disputes, arbitral tribunals may need to issue interim and interim awards on an urgent basis to protect the rights of the parties. The arbitral tribunal shall issue such emergency award in accordance with the agreement between the parties to the arbitration and shall delegate such power to the arbitrator[2]. The Egyptian Legislature mentions this in Article 24/1. Unlike the Egyptian Legislature, the Jordanian Legislature has given the arbitral tribunal the power to make interim awards without the consent of the parties, allowing the arbitral tribunal to make such awards without being bound by the wishes of the parties. The legislature also allows the arbitral tribunal to make interim awards or arbitral awards on partial applications before rendering a final judgment ending the entire dispute, in accordance with Article 40 of Jordanian legislation.

3 Validity of Commercial Arbitration Award and Its Legal Effects

This section covers various aspects related to the validity of commercial arbitration awards, including the concept of validity, scope, connection with public policy, and validity and termination.

3.1 Concept of Validity of Commercial Arbitration Award

Validity here refers to a judgment that reflects the authenticity of the matters decided by the parties within the scope of the reasons stated in the lawsuit [8]. This means that what has been submitted to and decided upon by the judiciary cannot be reconfirmed in proceedings before the judiciary unless the methods and time limits prescribed by law are followed [9].

The concept of the validity of an arbitral award is similar to that of a court judgment. An arbitral award has the same effect as a court judgment prescribed by the legislative body. The Supreme Court of Appeal of Egypt ruled in Appeal No. (2010/64) on January 22, 2008 as follows: "The arbitrator's award, like a court award, becomes effective with respect to the subject matter upon issuance and shall remain in force as long as the award is The power remains."

Once an arbitral award is made, it takes effect on the matters decided and has two functions. First, respecting the person making the decision has a positive impact. Secondly, the negative impact of preventing judicial authorities or other arbitral tribunals from re-examining the dispute. The arbitration agreement itself has both positive and negative consequences. If the parties agree to submit a dispute to arbitration, they undertake to submit it to an arbitral tribunal to obtain a binding arbitral award without resorting to the relevant judicial system. The positive effect forces the parties to comply with the arbitration procedure, while the negative effect prevents the dispute from being brought before the judiciary again in the presence of a valid arbitration agreement.

The validity of the arbitral award is confirmed if the causes and subject matter of the previous and current disputes are consistent. In this case, the party who obtained the award has the right to assert the validity of the award (the validity of the matter decided). The Jordanian legislature expressly recognizes the validity of the arbitral award in accordance with Article 52 of the Jordanian Arbitration Law No. 16 of 2018.

However, there are jurisprudential disputes over the validity of arbitral awards made by private parties rather than by judicial authorities. Some object to the validity of arbitral awards rendered by non-judicial bodies, while others argue that validity is determined from the date of the award and not necessarily by an execution order. It is generally believed in the legal community that an award takes effect from the date of the award, regardless of whether it is promulgated or executed. Reaching consensus does not require announcement or submission of the award; a written and signed judgment is sufficient [10].

3.2 Scope of Validity of Commercial Arbitration Award

After understanding the concept of validity, we clarify its scope from two aspects: the subject matter (the location of the dispute) and the personal scope (the parties to the dispute).

Subject Matter Scope

The subject matter of the dispute relates to a dispute before the arbitral tribunal. The validity of the arbitration award is limited to the scope of the dispute resolved by the award. The arbitral tribunal is obliged to rule only on the dispute raised and its decision shall not go beyond the scope of that dispute. An arbitral award may be set aside if the arbitral tribunal makes an award on a matter that is not in dispute. However, if the arbitral tribunal fails to rule on part of the dispute, the effectiveness of the arbitral award does not extend to the unawarded part, and the parties may seek additional awards. If approved, its validity will also apply to these additional judgments [8].

The determination of the subject matter of the dispute is crucial to the scope of application. Once the matter is decided, it shall not be brought before the Judiciary or any other tribunal again for the purpose of maintaining the validity of the matter decided. This clarifies the legal position of the parties, and its effect only applies to substantive matters, excluding procedural matters such as court rulings without jurisdiction. In this case, the reopening of the proceedings is allowed, the validity of which is limited to the substantive subject matter of the dispute [3].

Personal Scope

The validity of the arbitration award is only valid for the parties to the dispute. It applies to the original parties to the arbitration agreement and the arbitral award is not enforceable against third parties. A party who is an agent or representative of a legal entity enjoys the validity of an award only in its original capacity and not as an agent or representative [8].

In this personal area, the legal position of the parties in the arbitration proceedings is taken into account. An individual can serve as an agent or representative of a legal person, and the effect remains with the original person. If there are multiple parties to the dispute, the lawsuit will be brought against the specific party and the judgment will not affect other parties not involved in the dispute. Challenges to the validity of an arbitral award may be directed against general and specific legal successors. The enforcement of an arbitral award may cause damage to the parties, but it does not affect the rights of non-parties [11].

The personal scope of commercial arbitration is relative. Enforcement of commercial arbitration judgments is entirely directed at the parties, enabling them to benefit from the legal consequences of the judgment. However, the validity of the judgment can also be challenged against third parties. The legal effect of the arbitration award is limited to the parties to the dispute and does not extend to third parties. Jordan's

Supreme Court ruled that "the arbitrator's award applies only to the parties to the dispute."

Validity is therefore the legal description attached to an arbitral award, the impact of which is both positive, insofar as it involves respect for the arbitral award, and negative, in that they prevent disputes from being heard again before judicial bodies or other courts.

It should be noted that challenges to an arbitral award can also be brought against non-parties, such as guarantors. However, the guarantor is not bound by the validity of the arbitration award. Instead, legal action is taken based on contractual obligations arising from the security agreement. The same applies to general and special heirs, legal representatives and legal representatives who each challenge the arbitral award in accordance with their respective legal principles.

The issue of extending the validity of commercial arbitration awards arises in the context of corporate groups. The effects of the arbitration award will extend to these companies if their financial liability is consolidated and they have separate legal personalities. However, if each company within the group has its own legal personality and financial responsibility, an arbitral award can only be challenged against the parties to the arbitration agreement [11].

4 Effects of the Validity of Commercial Arbitration Award

We will now examine in more detail the impact of the validity of a commercial arbitration award on parties to a commercial dispute or third parties and explain when validity ends.

4.1 Effects of the Validity of Commercial Arbitration Award

The issuance of a legally binding commercial arbitration award has the following legal consequences for the parties to the dispute:

1. **Enforcement Obligation**: Parties to commercial disputes are obliged to enforce commercial arbitration awards. An arbitral award is binding and final and enforcement is generally voluntary and at the option of the party against whom the award is made. This is consistent with the original intention of arbitration, which is to speed up litigation procedures, save time and reduce costs, and is also a practice encouraged by international arbitration institutions [5].
2. **Prohibition of Rediscussing the Dispute**: Due to the validity of a commercial arbitration award, parties are obliged not to submit disputes resolved by arbitration to judicial authorities or any other arbitral proceedings, even if an order for enforcement of the award has not yet been issued. This helps stabilize and

safeguard an individual's legal rights and status and prevents unnecessary waste of time and expense by re-litigating disputes [12].

3. **Conclusion of the Arbitral Tribunal's Task**: The validity of a commercial arbitration award means the completion of the task of the arbitrator or arbitral tribunal. With the issuance of the award that ends the dispute, the arbitrator's job ends, except to correct significant errors in the award or to complete overlooked aspects [5].

4.2 Termination of the Validity of Commercial Arbitration Award

The validity of commercial arbitration awards is considered provisional. It relates to the arbitral award and remains unaffected even if no execution order has been issued, a dispute over the arbitral award's annulment has been raised or an action to set aside has been instituted. However, the validity of the arbitral award terminates upon the issuance of a judgment declaring that the arbitral award is set aside. In such event, the award will be deemed to have never existed and, upon execution of the award in whole or in part, the matter will revert to its previous status.

It is important to note that the validity of the award will remain in effect as long as the award remains in force and has not been revoked. The Cairo Court of Appeal ruled that the validity of the arbitral award continues as long as it remains valid without annulment. This is evidenced by Case No. 76 of 2007, in which the court stated: "Arbitration is a special way of resolving disputes, which is different from ordinary court procedures. Although arising from the will of the parties, the award of the arbitral tribunal is valid. "The arbitral award shall take effect once it is made and shall remain in effect while the arbitral award is valid and has not been revoked" [13].

5 Conclusion

This endeavor is made easier by the fact that arbitration ultimately uses state coercion to enforce awards made by arbitral tribunals. Arbitral awards are instruments of justice that allow the legitimate holder of a right to use state coercion to enforce that right and compel the debtor to comply with its obligations. Of course, international arbitration law is primarily concerned with the details of arbitral awards. Various provisions of the Arbitration Rules have been issued to regulate the subject matter of arbitral awards. This is an arbitral award worthy of recognition and lawful. Commentators have thought about what it is and what conditions it must satisfy in order to be recognized and therefore valid (in the sense of having legal force). The second clause concerns the question which court should be the competent court to issue an order for the enforcement of an arbitral award. The legislation regulates

the enforcement procedures for arbitral awards by clarifying the legal procedures that must be followed to convert an arbitral award into a legally binding court order. In addition, rules are established to clarify what documents must be submitted in order to enforce an arbitral award. These documents are used to prove the validity of the arbitration award and form the evidentiary basis for enforcement. All of this highlights the careful attention to documentation of arbitral awards as part of maintaining the validity and security of court awards. The legislature has also addressed the conditions for the validity of arbitral awards by establishing legal standards that ensure that arbitral awards are well-founded and binding. The purpose is to exclude any factors that might impair the soundness and enforceability of the arbitration proceedings. In addition, the law governing arbitration provides for further time limits within which parties may seek to enforce an arbitral award. This time factor not only provides greater clarity to the proceedings but also alerts parties to the need to act quickly after arbitration, thus improving the ability to resolve disputes in a timely manner. In fact, in the formal arbitration legislation, basic norms and legal conditions have been formulated to regulate the entire procedure leading up to the final award of the arbitral tribunal, thus making the entire award a judgment of conduct. The test of legality can be withstood—an act is stripped of all that might render it invalid. In summary, the laws governing arbitration actually regulate all aspects of arbitral awards. These laws succinctly address the issues of recognition, enforcement, documentation and spatio-temporal conditions of validity and provide a balanced approach to enhance the advantages and effectiveness of arbitration for efficient and effective decision-making in all types of disputes. Legal Enforceability Determinations.

5.1 Results

1. Comparative legislative recognition that arbitration may be permitted to resolve disputes between parties. Domestic law provides for the rules of arbitration, in particular the recognition of arbitral awards and their proper enforcement, whether ratified or not.
2. There are two different concepts of arbitral awards: one involves a broad definition and the other involves a restrictive analysis, including only awards that decide the entire dispute.
3. The arbitral tribunal issues a final award and an interim award.
4. The enforceability of an arbitral award relates to the nature of the dispute and the arbitrability of personal jurisdiction.

5.2 Recommendations

1. The Jordanian Legislature proposes to limit the number of methods for determining the date of a ruling and designate one of these dates as the official date of the ruling for all legal purposes. We recommend that the official date is the date specified by the arbitral tribunal in the award and the date the award is published.
2. We also recommend that the Jordanian legislature define the terms of domestic and foreign commercial arbitration awards.
3. In this context, we recommend that the Jordanian Legislature extend the deadline for submission of applications for additional bonuses.
4. We also recommend that Jordanian arbitration institutions have the power to require parties to provide security for payment of the costs of emergency measures.

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The Impact of Technology-Enhanced Governance Standards on Senior Employee Satisfaction in Banks



Khaled Jumah

Abstract The study examines how technology-enhanced governance standards in non-traditional banks influence senior employee satisfaction. A questionnaire was employed, comprising two sections: one gathering information on senior employees and the other including 30 items related to governance standards and employee satisfaction. Out of 210 distributed questionnaires, 196 were completed and analyzed. The results indicate that senior employees are generally satisfied with the implementation of these governance standards, reflecting a positive correlation between technology-driven governance practices and employee contentment. The study's findings are relevant to the broader banking sector and provide valuable insights into how technological advancements in governance can impact employee satisfaction.

Keywords Technology · Governance · Standards · Banks · Satisfaction · Employee satisfaction

1 Introduction

In 1997 many companies collapse and bankruptcy due to the lack of professional ethics, fraud and accounting errors, which negatively affected the global stock exchange and led to the application of the concept of governance in financial institutions to ensure the safety of the banking system, and the safety of the funds invested in it and to avoid the crises that hit many financial and banking institutions in various developed and developing countries [1]. The term governance was used first at the macro level (international) and this is what is known as international governance, and then used at the micro level (establishments) and this is what is known as enterprise governance [2]. Although there are many determinants facing the governance of

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non-traditional financial institutions such as legal determinants and environmental determinants, the governance in Non-traditional financial institutions has a more comprehensive concept than its counterpart in conventional financial institutions because Non-traditional governance adopts financial standards and social standards. Non-traditional banks have relied on permissible and legitimate banking transactions, such as buying and selling, speculation and partnership, benefiting from exchange rates, currency exchange, and adhering to Sharia standards and also adhered to the terms of presentation and disclosure of the financial statements which reflects the governance practices at any time in order to ensure timely disclosure of information, and this information can be published on the bank's website, so that it is easy to access [3]. One of the reasons that led to bank governance is the desire to improve economic efficiency and review and amend the laws governing the performance of increasing the awareness of management officials and stakeholders about the governance of banks and achieving integration with the legal, regulatory, and institutional environment of the bank.

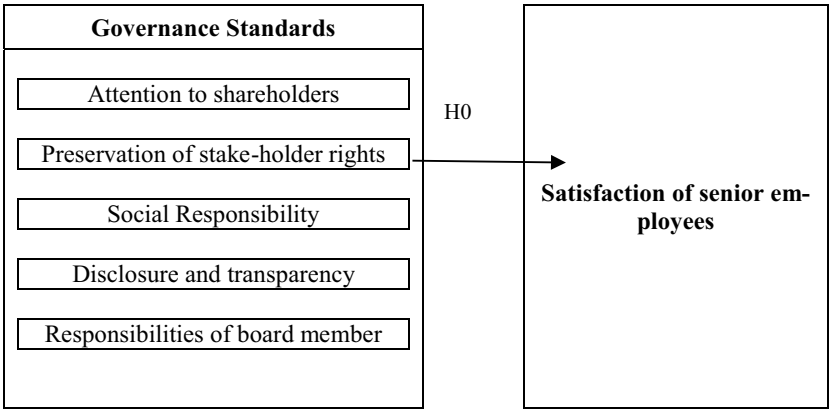
1.1 The Problem of the Study

The problem of the study can be formulated with the following main question: What is the impact of the application of the governance standards of non-traditional banks on the satisfaction of senior employees?

1.2 The Importance of the Study

The importance of this study lies in assessing the impact of applying governance standards on the satisfaction of senior employees. It is expected to contribute to increasing the knowledge yield towards the governance of Non-traditional banks and enrich the national library with an important topic that links the role of governance with the success of Non-traditional banks. Moreover, the importance of the study is manifested practically from its results that may help decision-makers in Non-traditional banks to raise the level of ability to develop strategies in a way that enhances the strengths of the bank.

1.3 The Model of the Study



Source Developed by the researcher

1.4 The Hypotheses of the Study

The main hypothesis

- H0: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) of the application of governance standards combined (attention to shareholders, preservation of stakeholder rights, responsibilities of board members, disclosure and transparency, and social responsibility) on the satisfaction of senior employees in Non-traditional banks.

The sub-hypotheses

- H01: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for attention to shareholders as one of the governance standards on the satisfaction of senior employees in Non-traditional banks.
- H02: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for responsibilities of board members as one of the governance standards on the satisfaction of senior employees in Non-traditional banks.
- H03: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for preservation of stakeholder rights as one of the governance standards on the satisfaction of senior employees in Non-traditional banks.
- H04: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for disclosure and transparency as one of the governance standards on the satisfaction of senior employees in Non-traditional banks.

- H05: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) for social responsibility as one of the governance standards on the satisfaction of senior employees in Non-traditional banks.

1.5 Terminology

Governance: is to strengthen the monitoring of the institution's activity towards achieving the goal and may be separate from it or related to the administration, and there are a number of people in government to manage the activity. Governance—Wikipedia (wikipedia.org).

Non-traditional banking: means the banking system or activity which is Sharia-compliant. (https://ar.wikipedia.org/wiki/Islamic_banking).

Satisfaction: It relates to the employee's expectations and what he actually gets. These expectations may be personal and different from the expectations of others for several reasons, including functional and psychological reasons. (https://hbrarabic.com/Managerial/Job-SatisfactionConcepts).

2 Literature Review

The study of Simona [4] showed the strengths and weaknesses faced by stakeholders when applying corporate governance standards, and the study also showed the role of the depositor when applying non-traditional bank governance models. The study of Ali Jan [5] developed a number of proposals to promote sustainable development of governance procedures for Non-traditional banks and encourage banking services to grow. The research focused on the basic elements of the governance of Non-traditional banks, in terms of legitimacy, ownership and impact on the social environment. Alam study [6] concluded that social and political restrictions have a significant impact on performance. Alam [7] showed that the Non-traditional banks in Bangladesh are the ones who ratify and approve the business of Non-traditional banks. The study carried out by Reyad [8] aimed to identify the challenges associated with the operations of brokers due to the risks of not following Non-traditional law, and the results of the study showed that brokers manage their business well during bank governance. Tashkandi study [9] included a sample of 27 brokers, and the study was conducted between 2005 and 2020, showed that Sharia supervision has a significant impact on identifying intermediaries. A study of Hana [1] showed that the bank's financial performance, in a number of Gulf countries found that brokers feel that there is a relationship between quality and financial performance and that brokers value the effectiveness of the Sharia Supervisory Board much more than traditional governance mechanisms. Kausar's study [2] showed that SG emphasizes

the need to comply with Non-traditional law and considers development an important basis for applying the principles of non-traditional law. Idah [3] explained the importance of scientific publications related to Non-traditional banks and there are a number of important topics when studying Non-traditional banks, including governance, auditing, and supervision. The most important feature of our study is that it is the first study, which deals with the identification of governance standards that achieve the satisfaction of senior employees in Non-traditional banks, in addition to that it will provide a number of recommendations to develop and improve the standards. The study conducted by both Khleel and Ali [10] showed that there is a correlation between governance and its dimensions. The study suggested the necessity of applying governance in universities because it reflects the systems and laws that lead to quality. Riffat [11], compared the performance of Non-traditional and commercial banks in Saudi Arabia and concluded that Non-traditional banks have the ability to achieve profits, in addition to that the activity of these banks is greater than others.

3 Methodology

3.1 Participants

After reviewing the questionnaires, (14) were excluded due to leaving some data and questions blank, and thus the sample size reached (196) respondents. From Table 1 we notice that 75.0% of the sample are male and 37.8% with age from 40 to less than 50 years old. Also 60.7% of the sample have Bachelor degree and 43.4% number of years of service in the bank is from 15 years to less than 20 years.

3.2 The Questionnaire

The questionnaire included two parts, the first part contained information about the senior employees. The second part included 30 paragraph related to governance standards in Non-traditional banks, and satisfaction of senior employees.

3.3 Validity and Reliability

The questionnaire was presented to a number of specialists in universities and experts in Non-traditional banks, and it was amended after taking into consideration their observations and recommendations. The stability coefficient Cronbach's Alpha was extracted and reached 0.78, which is acceptable for research purposes.

Table 1 Sample characteristics

Variable	Frequency196	%100
Gender		
Male	147	75.0
Female	49	25.0
Age		
Less than 40	60	30.6
From 40 to less than 50	74	37.8
50 and more	62	31.6
Qualification		
Bachelor	119	60.7
Graduate	77	39.3
Number of years of service in the bank		
Less than 15 years	77	39.3
From 15 years to less than 20 years	85	43.4
20 years and above	34	17.3

3.4 Limitations

- Human Limitations: The study was limited to senior employees in Non-traditional banks
- Time limitations: The study was conducted in the first semester of the academic year 2023/2024
- Subject Limitations: Governance standards in Non-traditional banks and their impact on the satisfaction of employees in supervisory positions.

3.5 Analysis and Discussion

The study included an independent variable, which is the standards of governance of Non-traditional banks and a dependent variable, which is the satisfaction of senior employees. The descriptive analytic approach was used and a questionnaire designed for the purpose of research, data collection and hypothesis testing was adopted.

What is the impact of the application of the governance standards of non-traditional banks on the satisfaction of senior employees? We used descriptive statistics and inferential statistics Table 2.

Table 2 shows that the means of all variables are higher than 4.4 out of 5.The employees preserving variable has the highest mean 4.7265.The satisfaction with the lowest mean 4.4490.

This means that the respondents feel strongly (almost 4.7265 out of 5) about the employee preserving meaning that they are satisfied with the application of the governance standards.

Table 2 Means and the standard deviations

	Mean	Std. deviation
Stakeholders attention	4.6265	0.55885
Preserving the rights of stakeholders	4.7265	0.38258
Responsibilities of the members of the Board of directors	4.6602	0.54070
Disclosure and transparency	4.6459	0.53869
Social responsibility	4.5357	0.61482
Employee satisfaction	4.4490	0.73425
Valid N (listwise)		

H0: There is no statistically significant effect at a significance level ($\alpha \leq 0.05$) of the application of governance standards combined (attention to shareholders, preservation of stakeholder rights, and responsibilities of board members, disclosure and transparency, and social responsibility) on the satisfaction of senior employees in Non-traditional banks. Tables 3, 4 and 5 showed the results.

Table 3 shows that R = 0.783 which means that the Correlation Coefficient between the governance standards of the independent variable and the dependent variable is 0.783 which is a big value. Also the Coefficient of Determinantion is $R^2 = 0$ 0.613, meaning that 61.3% 0f the variation in employees' satisfaction is explained by the independent variable.

Table 4 shows that F = 60.117which is larger than the tabulated value, and Sig = 0.000 meaning that the regression of employees satisfaction on the independent variable is significant.

From Table 5 we see that VIF (Variance Inflation Factor) of each dimension of the Independent Variable is less than 5.This means that the dimensions are not highly related and therefore all of them can be included in the analysis. Tolerance is 1/VIF and must be > 0.2 for each dimension to be included in the regression analysis, which is the case.

Table 3 Model summary M1

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.783	0.613	0.603	0.46292

Table 4 ANOVA M1

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	64.414	5	12.883	60.117	0.000
	Residual	40.716	190	0.214		
	Total	105.130	195			

Table 5 Coefficients M1

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
Stakeholders attention	0.597	0.115	0.454	5.194	0.000	0.266	3.757
Preserving the rights of stakeholders	0.020	0.104	0.010	0.190	0.849	0.693	1.443
Responsibilities of the members of the Board of Directors	− 0.121	0.097	− 0.089	− 1.245	0.215	0.397	2.516
Disclosure & Transparency	0.408	0.117	0.299	3.499	0.001	0.279	3.587
Social responsibility	0.176	0.089	0.147	1.970	0.050	0.366	2.735

Table 5 gives the regression coefficients B's of the 5 dimintions of the independent variable and shows which ones are significant and which ones are not significant by giving the values of t and Sig.

It is seen that, Stakeholders attention and Disclosure and Transparency have statistically significant effect on employees satisfaction with Sig = 0.00 and 0.001 respectively, Stakeholders attention effect B = 0.597. Disclosure and Transparency affects employees' satisfaction positively with B = 0.408 meaning that every change of one unit in Disclosure and Transparency affects employees satisfaction by 0.408 unit. Social responsibility has positive effect on employees satisfaction with B = 0.176 and Sig = 0.05. This is considered significant since Sig = 0.05(equal to the criterion). It means that every unit of change in social responsibility (with all other dimensions fixed) affects employee's satisfaction by 0.176 unit. Preserving the rights of stakeholders effect is B = 0.020 (small) which means that every unit of change is Preserving the rights of stakeholders will have a small change of (0.020) unit in employees satisfaction. Social responsibility has negative effect B = − 0.121, but is not significant, Sig = 0.215 > 0.05.This mean that every unit change in Social responsibility (with all other dimensions fixed) will affect employees satisfaction with 0.121 unit negatively. Now instead of taking all dimensions of the Independent Variable combined, we shall test the effect of each dimension by itself. This is done by testing the following:

Testing H01

The results of testing H01 as follows:

From Table 6, it is seen that the Correlation Coefficients is 0.753 which is large, and the Coefficient of Determinantion is $R^2 = 0.567$ meaning that 56.7% of the satisfaction of senior employees is explained by Stakeholders attention.

Table 6 Model summary M2

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.783	0.613	0.603	0.46292

Table 7 shows that the regression coefficient is B = 0.989, t = 15.922and Sig = 0.000 < 0.05which means that Stakeholders attention has a significant effect on the satisfaction of senior employees. Regression coef B = 0.989 means that one unit change in Stakeholders attention made a change of 0.989 unit in employees satisfaction.

Testing H02

The results of testing H02 are given in Tables 8 and 9.

From Table 8, it is seen that the Correlation Coefficients is 0.511 which is fairly large, and the Coefficient of Determinantion is $R^2 = 0.261$ meaning that 26.1% of the satisfaction of senior employees is explained by responsibilities of board members.

Table 9 shows that the regression coefficient is B = 0.694, t = 8.286 and Sig = 0.000 < 0.05which means that responsibilities of board members has a significant effect on the satisfaction of senior employees.

Testing H03

The results of testing H03 are given in Tables 10 and 11.

Table 7 Coefficients M2

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1		− 0.126	0.289		− 0.436	0.663
	Attention	0.989	0.062	0.753	15.922	0.000

Table 8 Model summary M2

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.511a	0.261	0.258	0.63265

Table 9 Coefficients M2

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1		1.213	0.393		3.087	0.002
	Responsibility	0.694	0.084	0.511	8.286	0.000

Table 10 Model summary M3

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.280	0.078	0.074	0.70667

Table 11 Coefficients M3

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1		1.908	0.627		3.042	0.003
	Preserving	0.538	0.132	0.280	4.065	0.000

From Table 10, it is seen that the Correlation Coefficients is 0. 280 which is large, and the Coefficient of Determinantion is $R^2 = 0.078$ meaning that 7.8% of the satisfaction of senior employees is explained by preservation of stakeholder rights members

Table 11 shows that the regression coefficient is B = 0.538, t = 4.065and Sig = 0.000 < 0.05which means that preservation of stakeholder rights members is significant.

Testing H04

The results of testing H04 are given in Tables 12 and 13.

From Table 12, it is seen that the Correlation Coefficients is 0. 717 which is fairly large, and the Coefficient of Determinantion is $R^2 = 0.514$ meaning that 51.4% of the satisfaction of senior employees is explained by disclosure and transparency.

Table 13 shows that the regression coefficient is B = 0.978, t = 14.336 and Sig = 0.000 < 0.05which means that disclosure and transparency has an effect on impact application of the governance standards on the satisfaction of senior employees.

Table 12 Model summary M4

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.717	0.514	0.512	0.51297

Table 13 Coefficients M4

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1		− 0.093	0.319		− 0.291	0.771
	Disclosure	0.978	0.068	0.717	14.336	0.000

Table 14 Model summary M5

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.671	0.451	0.448	0.54559

Table 15 Coefficients M5

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1		0.812	0.291		2.793	0.006
	Social responsibility	0.802	0.064	0.671	12.616	0.000

Testing H05

The results of testing H05 are given in Tables 14 and 15.

From Table 14, it is seen that the Correlation Coefficients is 0. 671 which is fairly large, and the Coefficient of Determinantion is $R^2 = 0.$ 0.451 meaning that 45.1% of the satisfaction of senior employees is explained by social responsibility.

Table 15 shows that the regression coefficient is $B = 0.802$, $t = 12.616$ and $Sig = 0.000 < 0.05$which means that social responsibility has an effect on impact application of the governance standards on the satisfaction of senior employees.

3.6 Results

The results of the questionnaires were analyzed and whereby that tolerance must be > 0.2 for each dimension to be included in the regression analysis, which is the case. The regression coefficients B's of the 5 dimension of the independent variable shows which ones are significant and which ones are not significant by giving the values of T and Sig.

It is seen that, attention and disclosure have statistically significant effect on employees satisfaction with $Sig = 0.00$ and 0.001 respectively, attention effect $B = 0.597$ i.e. it affects employees satisfaction and disclosure affects employees' satisfaction positively with $B = 0.408$. Social responsibility has negative effect, but not significant, $Sig = 0.215 > 0.05$. Social responsibility has $B = 0.176$ with $Sig = 0.05$ meaning that social responsibility affect the employees satisfaction. When each dimension was tested through simple regression, it was found that all five dimensions each separately affect employees' satisfaction positively.

3.7 Recommendations

1 Training employees in Non-traditional banks and developing their skills in the field of governance.
2 Empowering employees to apply governance standards to be able to implement them effectively.

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The Future of Digitizing Manuscripts: Technological Visions and Trends



Alalddin Al-Tarawneh and Ali AlRahamneh

Abstract This study examines the practices of digitizing manuscripts and the development of some technological tools in this area. The article focuses on the development of the field of digitization of manuscripts. Discusses the use of software for this purpose to adapt it to a specific field, the method of organizing manuscripts so that the organization is consistent and appropriate, the network development used to network these collections, the use of some hardware upgrades, and other activities aimed at improving the usability of digitized collections. This article discusses global developments in information technology, the development of digital media and its developments in order to predict the possible impact of these changes on the field of manuscript digitization. The chapter argues that more should be invested in digital technologies than in old preservation methods, which are based on the changing development of the librarian profession, as was the case in the era of information and communication technologies. It is still rich in manuscripts that reflect much of its culture and history. These manuscripts are kept as a legacy for future generations, as they are considered intellectual heritage and one of the basic sources of information. This article reviews the status of digitized manuscripts, forecasts the future development of this technological field, and discusses the achievements that have been achieved. Although the study is narrow, the final recommendations and discussed conclusions help towards new steps in manuscript digitization.

Keywords Digitization of manuscripts · ICT · New trends in digitization · Technology

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1 Introduction

To truly understand manuscripts, one must first delve into their geographical, historical, and cultural surroundings. It is clear that each manuscript is a product of its environment, with its socio-economic, political, cultural, and spiritual climate reflected within its pages. By gaining insight into the broader landscape, we can approach the handling and digital preservation of these manuscripts with greater coherence and foresight.

The people of Oman had a talent for shipbuilding and navigation, and their country was an important connector between Arab countries and other regions. Strategically located at the meeting point of three continents and four seas, Oman played a crucial role in connecting countries along the Indian Ocean coast. The friendly Omanis readily interacted with diverse cultures from around the world, forging strong ties with regions including the Arabian Gulf, Europe, the Far East, and the eastern coasts of Africa [1]. According to historian Miles, Oman played a vital role in bridging the gap between Mesopotamia and India, thanks to the seafaring skills of its inhabitants. Oman's geographical location granted it influence in the Gulf, the Indian Ocean, and even the Mediterranean basin. In fact, Miles also notes how Omani merchants helped transfer the cultures of Mina, Babylon, and Susa to India. As a result, Indians learned and embraced various fields of study, such as philosophy, astronomy, mathematics, and chemistry, from these civilizations [2]. In the sixteenth century, Oman was a rising empire that battled for power in the Arabian Gulf and East Africa against Portugal and the United Kingdom. Going even further back in time, Oman's inhabitants were amongst the earliest followers of Islam and actively proselytized their faith, earning the moniker "Land of Peace" from scholars [3].

Dating back almost a millennium, the Omani manuscript embodies a distinctiveness unique to its time period. It stands as an exemplary testament to Oman's past, holding the title as the eldest of its kind to be found within the country's boundaries. Despite numerous Omani manuscripts extending outside Oman, the abundance of manuscripts present in foreign lands still manage to exceed established knowledge. Oman has taken measures to ensure their preservation while promoting access via technological advancements, which aligns with similar efforts executed by countries internationally [4]. Since 2005, Oman has taken up the practice of "manuscript digitization" which has been in use worldwide for two decades now [5]. This study delves into certain facets of "manuscript digitization" peculiar to the Sultanate of Oman.

2 Methodology

Within this research, two primary facets of significance come to light: theoretical and practical. As we navigate the scientific variables of today's world, it is essential to keep pace with the interactions and effects brought about by the revolution of

information technology and communication, in all aspects of life. Manuscript digitization, a critical pillar of our national and cultural heritage, holds utmost humanitarian dimensions [6]. This significance is even more pronounced in Oman, with its rich intellectual heritage, where the digitization of Omani manuscripts takes on particular importance within the academic theoretical framework. Given Oman's expanding interest in utilizing digital tools to broaden access to handwritten heritage for researchers and enthusiasts, it's important to showcase the tools and means that are available, as well as their practical and scientific substantiations [7]. Moreover, the chapter seeks to address the following queries:

1. The digitization of manuscripts has seen various advancements, but what are the key elements that define this process?
2. The digitization of Omani manuscripts has yielded what successes for the Sultanate of Oman?
3. Prospects for advancing the digitization and development of Omani manuscripts are currently being considered in view of new developments, available possibilities, and constraints. What proposals are on the table for these future efforts?

3 Literature Review

The study conducted by Al-Nabhani and her associates [8], delving into Arabic studies sought to pinpoint the endeavors of information organizations located in the Sultanate of Oman. The objective was to secure access to information, in order to aid in sustainable development by 2030. Multiple findings were produced by the study; however, the prevalence of four access categories that surpass the established structure of information access, proved to be the most vital. These access categories comprise multilingual access, access to accommodate those with special needs, access attained through education and instruction, and access enabling dissemination of the whole spectrum of information. The Cultural Grants Center stands apart, relying on its library to provide information resources, while the other information institutions in the sample offer differing forms of access to all. To meet individual needs, the study recommends the improvement of information access skills and awareness.

Regarding the digitization of manuscripts, Wald Linsari's study [9] delved into the Algerian National Library's experience in this process. The project management and necessary steps for manuscript digitization were specifically examined. The study underscored the significance of this undertaking and provided a rundown of the stages involved. Furthermore, the results of the field study were presented. Ultimately, the importance of meticulously planning out manuscript digitization projects and enhancing human qualifications in both planning and digitization were deemed necessary by the study.

For his research project [10], Jawad took on the challenge of defining the digitization process for manuscripts, along with storage options and organizing tactics to

ensure preservation and online accessibility. He chose an analytical and descriptive method for this task, studying various manuscript catalogs and evaluating the pros and cons of the ones used in the Iraqi Manuscripts Library. His findings suggested the need for a revamped and modernized cataloging system, one that can keep pace with the latest advances in technology. He also discovered that the library lacks a written policy for cataloging and archiving manuscripts electronically, and that older methods are still being used.

Investigating the status of Arabic manuscripts on the internet, Al-Aqou [11] surveyed websites that display these manuscripts in Arabic or other languages such as English. By identifying and analyzing eighty-four specialized websites, the study aimed to assess their quality and status to provide researchers access to these manuscripts. It was also noted that only 10% of such manuscripts are available online.

Omani libraries were the focus of Salem's research [12], intended to ascertain the knowledge level of librarians regarding the Manuscript Protection Law's stipulations, its comprehensibility, and implementation to safeguard manuscripts and ensure their availability. The study also evaluated how this knowledge affected Omani manuscript collection management, particularly in digitization initiatives, exposing gaps in legal comprehension and acknowledgement, and recommending ways to surmount these issues.

In order to prevent the redundancy of plans and objectives, Al-Zahimi investigated the digital projects related to manuscripts in Oman. Their focal point involved assessing the centrality of these projects. During their research, they examined projects by the Ministry of Heritage and Culture, the Ministry of Awqaf and Religious Affairs, Sultan Qaboos University, and Oman Digital Library (Kokb AlMa'arifa). According to their study, the first digitization project in Oman was founded in 2005, however, there was a lack of a clear written policy regarding digitization projects for Omani manuscripts during the study. In 2010, Kokb AlMa'arifa contained 3000 digital manuscripts whereas the Ministry of Awqaf and Religious Affairs held the majority with about 14,000 manuscripts. Meanwhile, the Ministry of Heritage and Culture owned 1300 manuscripts and Sultan Qaboos University had a collection of 6000 manuscripts. However, the study revealed that there was a clear absence of cooperation among digitization initiatives within Oman, suggesting the need for a solitary governmental organization to establish a consistent national policy on manuscript digitization and effectively implement it.

Synthikomar's research [13] investigated digitization techniques, with a particular focus on libraries and manuscripts. The study found that individuals often fail to make full use of these tools, resulting in a negative impact on the availability of knowledge and information. The study further explored various avenues such as technologies, software, file formats, and storage within this complex field.

In the examination conducted by Phillips and Tabrizi [14], the digitization process for historic documents was explored. An evaluation of digitization approaches and technology was analyzed over the past few decades alongside newer advances. Their inquiry focused on developments within the equipment, devices, and digitization software, noting significant shifts within this area. Elucidation was given on the

formation and function of algorithms, tools, and databases relevant to the manuscript processing field.

In order to take stock of the digitization of Iranian manuscripts, Madden and Saifi's [15] research honed in on how digitizing the Iranian manuscript heritage has become a topic of interest within numerous institutions, such as the National Library and Iranian Archives. A vast array of digital alternatives for preserving Iranian manuscripts were considered and reviewed. The significance of digitization in the preservation of Iranian manuscript heritage was explored, with emphasis on issues like the vulnerability of manuscripts and the benefits of enhancing access for researchers who would otherwise be limited by physical restrictions.

4 Digitizing the Manuscripts

Using cameras, scanners, and various electronic devices, digitization is the process of transforming physical objects into a digital format. According to the UNESCO Basic Principles for Digitization document, this involves a series of stages, from selection and evaluation to differentiation and preparing assets for digitization. The process also includes creating metadata, imaging, digitizing selected sources, and publishing digital resources through access systems and digital repositories [16, 17].

To protector manuscripts from harm, digitization is ideal. This also permits people to view the works without having to use the original copy. Additionally, digitization brings attention to the attributes of the intellectual production in the manuscripts. The endeavor involves the allocation of appropriate human and monetary resources, calling for experts in cataloging, critical editing and publishing, as well as technical staff. Scanners, computers, and various storage devices are also essential equipment for digitization [18].

Before initiating digitization, manuscripts undergo various phases of sorting, preserving, and repairing. After these steps, digitization occurs through two primary modes: Image Mode and Text Mode. Despite the unique features of Arabic calligraphy and manuscripts, Image Mode is typically relied upon for digitization, unless circumstances allow for text-based digitization. During Processing, which comes after, images are optimized, dimensioned, and stored as appropriate file formats, such as (pdf) or (jpeg). Consistent quality control and adherence to standards are integral throughout all these procedures. To make searching easier for indexers in the future, metadata entry is undertaken. The manuscripts become available to users after being stored in a specific format [19].

The transition from traditional manuscript libraries to digital libraries is a key reason why the digitization of manuscripts is crucial. This indispensable process protects manuscripts from damage and loss. By adopting digitization technology, digital manuscript libraries are created. The transfer of manuscript contents onto digital media via digitization is crucial. The contents can be uploaded onto cloud-based platforms or stored onto optical discs. This method of accessing manuscripts is beneficial as the original manuscripts no longer need to be referred to, with the

exception of specific cases. It also significantly reduces the risk of damage or loss, especially for ancient manuscripts that have been written on parchment or paper [19].

5 Manuscripts Digitization

Estimations propose that there are around 50,000 manuscripts in Oman that are dispersed between various government and private libraries, as well as in homes of local inhabitants. In 2005, efforts to digitize these manuscripts began [18], although a year prior to that, there were already ideas, opinions, and directions established. Oman's multitude of manuscripts offers a wealth of knowledge waiting to be digitized. Providing a substantial contribution to the worldwide Arab, Islamic, and human legacy, lie tens of thousands of Omani manuscripts and historical documents. These ancient texts span across various fields of literature and sciences and have been renowned among scholars for their academic value. Preservationists of Oman's intellectual heritage have found a vast avenue for conservation and access provision, with modern imaging, storage, and digital retrieval technologies. The digitization of Omani manuscripts has made it possible to collect, safeguard, and retrieve them for scholarly purposes in an unprecedented manner. To fulfill the objective of digitizing manuscripts and offering them to knowledge seekers and scholars with scholarly editing of the highest caliber, certain challenges are to be taken into consideration. Retrieving numbered texts can be quite challenging due to weak or missing indices, and duplicating content in Arabic digital libraries is a persistent concern resulting from repeated imaging of particular libraries. These factors pile on burdens for researchers, primarily in the collection and comparison of different manuscript copies [16].

The Omani Ministry of Heritage and Culture's website has specific sections devoted to manuscripts (https://www.mhc.gov.om/ministry-projects/manuscripts/), which showcases the "Omani Manuscripts Electronic Platform project that permits investigators, specialists, and anyone keen from several nations across the globe to view and acquire the manuscripts at a modest price. With a variety of themes, the Ministry of Heritage and Culture is the proprietor of over four thousand manuscripts, which have been amassed, fixed, conserved, and digitally converted, resulting in the first of its kind in the Sultanate" [20]. On the website, the area regarding digital manuscripts is evidently undergoing maintenance, updates, and reconstruction.

In the Omani Ministry of Heritage and Culture, there is a project exclusively focused on maintaining manuscripts owned by the Sultanate of Oman's Ministry of Culture and Information. The first method of digitization implemented was microfilm technology which, in retrospect, is now seen as conventional compared to modern, computerized digitization. Ultimately, the Ministry decided to revise the digitization process to ensure the manuscripts were captured accurately, with numbered, colored and top-quality copies. They then indexed and preserved them [21]. As of 2015, the Ministry was in ownership of a considerable 4500 Arabic manuscripts [11]. The Ministry of Heritage and Culture released several manuscripts guides in

the late 1900s and early 2000s that covered various fields, such as chemistry, literature, astronomy, Islamic sciences, Arabic language, medicine, and many others. Omani institutions handling manuscript digitization include Sultan Qaboos University, Ministry of Heritage and Culture, Ministry of Endowments and Religious Affairs, and the Omani Digital Library (Planet of Knowledge) [18]. By accessing the Heritage Ministry's manuscript indices from July 2022, the researcher discovered five Portable Document Format (pdf) indices, the oldest edition of which dates back to 1995.

The concept of digitization, including high-resolution scanners [Resolution], has been utilized by the Omani Ministry of Heritage and Culture to preserve and compile manuscripts in the Sultanate of Oman starting in 2009. This legal authority has been responsible for these efforts since 1977, having incorporated microfilm technology as well. In 2003, the Ministry of Endowments and Religious Affairs embarked on the creation of a digital repository of Omani manuscripts, with the aim of establishing a customized electronic library in the domain of religious studies and catering to its stakeholders, including staff, learners and educators of the College of Religious Sciences. Over time, this initiative grew to encompass manuscripts representing diverse fields of learning [1]. A key undertaking executed by the Information Technology division of the Ministry of Endowments and Religious Affairs in Oman is the assembling and digitizing of manuscripts authored by Omani scholars using cutting-edge technological tools. Since 2004, a digital imaging project for manuscripts has been underway in the Planet of Knowledge digital library. On average, 650 pages are digitized daily and each manuscript is individually indexed [22]. To supplement these efforts, a specialized employee was designated by Sultan Qaboos University in 2007 to photograph and digitize manuscripts and documents. A portable digital camera is used to ensure preservation of the manuscripts after imaging [16].

6 Visions and Prospects of Manuscripts Digitization

Manuscript access and usage has been revolutionized in the last two decades. Greater availability of digital alternatives is widely accepted as positive, yet dialogue continues regarding the selection and presentation standards for digitized manuscripts. Further discussion is necessary [23].

Many librarians have been wanting to optimize the digital exposure of their collections since Google Books became popular. However, in the rush to digitize vast quantities of texts, precious advantages of digital technology for studying manuscripts and books as literary pieces may have been lost. In numerous instances, digitizing is handled like a version of film-based microphotography that deforms the manuscript's viewpoint and makes it seem less intricate and vulnerable than it truly is. Digital toolsets are readily available to thoroughly explore and scrutinize manuscripts beyond traditional color imaging. To treat manuscripts with the same care as archaeological artifacts, one must gradually examine them through various technical approaches and establish a diverse digital archive for said manuscript [24].

During the process of digitizing ancient manuscripts, the physical aspects of the books, their meaning, and possible harm during handling are often disregarded. Printed and illustrated books that lack numbering are often considered of lesser value compared to their text content. For practical reasons, focusing more on this aspect is the responsible way to approach digitizing books on a larger scale. Pointing out the significance of original manuscripts, when digitizing expensive and unparalleled works, is necessary. Moreover, taking the necessary precautions when handling the physical manuscript presents an impeccable focus on its physical materiality. Restorers and recovery craftsmen have to be relied upon for their expertise, keeping in mind that sometimes, depending on the manuscript's status, digitization may need to be less frequent or slowed down, or even suspended altogether. Over the long term, it is fundamental to give proper care and attention to the manuscript's importance and its historical text during digitization in order to preserve their unique heritage. To prepare a manuscript for digitization, a reference list ought to be accessible to reduce the risks of damage [25].

In the realm of Sultanate manuscript digitization, caution is key. Development in equipment, software, indexing, investigation, management, and accessibility all play a role in the careful and speedy digitization of these valuable resources. By implementing these measures, the Omani manuscript has found the right path towards digitization, ensuring that its contents are accessible without harm. The handling of the manuscript and its components, such as ink and handwritten pages, are of utmost importance and are treated as the treasure they are by all involved parties. The commitment to such care is evident in the diligence of those in the manuscript digitization field.

7 Conclusion

Everyone involved must pay close attention to Omani manuscripts throughout Oman and other regions, as they represent deeply significant aspects of Omani, Arab, Islamic, and human cultural heritage. Digitizing these manuscripts and providing digital access through modern technology is a practical accomplishment that facilitates information access. Additionally, this step serves as a "soft power" message, embodying the characteristics that Oman has long been known for in its policies and diplomacy.

Among the proposals and recommendations presented by the researchers, the following are considered of utmost importance, if not indispensable:

1. Owned by Omanis, cherished by Arabs, Muslims, and Oman's friends worldwide, the Omani manuscript is part of a historical and civilizational knowledge chain. To honor this heritage, it is essential to introduce the manuscript widely, sharing its aesthetics and intellectual content.
2. Expanding knowledge enrichment by digitizing manuscripts and coordinating with relevant Arab organizations in the field. Sharing experiences and knowledge,

has been a focal point of this conference and is a continuing practice. Diverse formats are utilized to achieve the same result.
3. So that numbered manuscripts are not only accessible to specialists, the publication of these documents should be expanded and awareness about them should be boosted.
4. In the realm of manuscript digitization, staying up-to-date with the latest software, devices, audit checklists, and global expertise in documentation, investigation, and indexing is crucial. This allows for leveraging unique knowledge and skills to convert manuscripts into their digital forms.
5. Joint management of manuscripts by relevant authorities is being considered through the potential creation of a centralized body.
6. Oman's exceptional manuscript heritage can be preserved, made more accessible, and gain worldwide recognition through these measures.

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Enhancing Social Identity Through Technology-Enhanced National Education Programs



Adnan Saraerah

Abstract This article examines how national technology-enabled education programs contribute to the development of social identity and sense of belonging, presenting key findings on categorization, identification and comparison using technology in the context of education and its practical application rooted in social identity theory. Provides an analysis of how technology can be used to develop inclusive national education programs that can provide a sense of belonging while valuing cultural diversity, using technology to incorporate cultural elements into education in a national context while providing a sense of global citizenship. Additionally, it provides a framework for future research on education, psychology, and social identity, with an analysis of how technology can be used to improve educational strategies and outcomes. Finally, it provides valuable insights for policymakers to develop evidence-based educational programs that instill a sense of nationhood in a globalized world.

Keywords Social identity · Technology · National education programs · Globalization

1 Introduction

National identity is a complex and multifaceted concept that has long captivated the attention of scholars, educators, and policymakers. It delves into the very essence of how individuals establish a sense of belonging and connection within the context of a nation [24, 33]. In various countries, national education programs play a pivotal role in shaping individuals' perceptions of their national identity and nurturing a profound sense of affiliation. This intricate development of national identity becomes even

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more pronounced in nations characterized by diverse populations with distinctive ethnic, religious, and cultural heritages [21]. The impact of national education on the shaping of a national identity holds global importance, frequently entwined with the distinct social and historical context of each individual nation [13]. Nestled in the heart of the Middle East, Jordan offers an intriguing backdrop for the exploration of the dynamic interplay between national education programs and the development of a collective national identity. Similar to many other nations, national education courses have played a central role in shaping the shared identity of its citizens. These programs are meticulously designed to provide a comprehensive insight into history, culture, values, and the importance of unity within a society characterized by diversity. Their primary goal is to nurture pride in the nation's cultural heritage and to promote a shared narrative that transcends the multitude of cultures and beliefs coexisting within the country [13, 31].

1.1 Problem Statement

National identity and the feeling of belonging play essential roles in the process of self-recognition and the cohesiveness of a society [26]. In some countries, which boast diverse cultural and ethnic communities, the impact of national education programs on the evolution of a unified national identity represents a multifaceted and urgent concern [28]. The historical importance, stability, and rich cultural diversity create an opportune environment for evaluating how national education courses affect different segments of society [5]. Examining how national education courses intersect with sociocultural, educational, and external factors is vital for shaping policies, improving curricula, and fostering social unity within this diverse context [5, 34]. This study is untangle the complex relationship between national education courses and the development of a shared national identity, providing valuable insights to enhance our comprehension of this intricate matter and foster unity in a diverse society. Our primary focus will be on evaluating the effectiveness and consequences of National Education Courses, employing the Social Identity Theory framework to delve into how individuals align with and engage in their broader national community. The objective of this research is to achieve a more profound understanding of the multifaceted nature of national identity in a country as diverse and historically significant, emphasizing the critical role of education in shaping this identity.

1.2 Research Questions

1. What is the impact of national education programs on the citizens' categorization, self-identification, and the eventual shaping of their national identity.

2. What policies and curriculum content currently pertain to national education, and to what extent do these align with the objective of nurturing national identity and promoting unity in a culturally diverse society.
3. What are the elements that contribute to the development of a sense of national belonging?

1.3 Research Hypothesis

In the context of this study on national identity and the influence of national education courses, a research hypothesis could be framed as follows:

- There is a significant positive relationship between the extent of categorization of individuals into social groups, as influenced by national education courses, and their overall sense of national belonging.
- There is a significant positive relationship between the strength of identification with social groups, as influenced by national education courses, and the development of a strong sense of national belonging among individuals.
- There is a significant positive relationship between the degree of comparison between social groups, as influenced by national education courses, and the strength of individuals' sense of national belonging.

2 Overview of National Education Courses

National Education Courses are a fundamental component of formal educational framework, serving a crucial function in fostering a shared sense of national affiliation among its diverse population [16]. These courses are strategically integrated throughout the educational journey, spanning from elementary to secondary levels, with the specific aim of imparting students a thorough comprehension of vibrant history, cultural legacy, values, and the principles of unity. In the early stages of education, students are introduced to the fundamental aspects of national identity, encompassing geographical knowledge and significant historical landmarks. As students' progress in their educational path, the curriculum explores more intricate topics, such as the underpinnings of the state, the social structure, and regional and global importance [9]. The principal aims of these courses encompass instilling pride in national heritage, fostering unity and responsible citizenship among all students, promoting active civic engagement, and preserving the cultural legacy of the country [23]. Qualified educators deliver the curriculum with an emphasis on cultivating critical thinking skills and facilitating discussions on topics that are pertinent to the nation. Given the diverse nature of society, there is a deliberate effort to integrate various cultural, religious, and ethnic perspectives to ensure inclusiveness. However, despite their significant role in shaping national identity, these courses are not without

challenges, and concerns have arisen regarding potential biases or one-sided narratives in the curriculum. Nevertheless, gaining an understanding of the structure, content, and objectives of National Education Courses offers valuable insights into their role within the country's educational framework and their potential influence on the collective identity of citizens [9, 23].

3 Challenges and Critiques of National Education Courses

National Education Courses, integral to shaping national identity, grapple with challenges and critiques. Concerns arise over potential biases in historical narratives, leading to calls for greater inclusivity and diverse viewpoints. Moreover, navigating evolving global dynamics poses hurdles in ensuring the curriculum remains current and pertinent to the contemporary world [23, 1]. National Education Courses encounter challenges amidst ongoing global discussions on education and national identity. Policymakers must adapt to the changing needs of a diverse society, emphasizing the necessity to align the curriculum with the intricate aspects of national identity in a dynamic world. Embracing constructive criticism plays a pivotal role in improving the courses, fostering a collective national identity while embracing and celebrating diversity [1].

4 Exploring Social Identity Theory: Categorization, Identification, and Comparative Aspects

Social Identity Theory, formulated by Tajfel and Turner during the 1970s, is a well-established psychological theory that delves into the processes by which individuals classify themselves and others into social groups, ultimately resulting in the creation of social identities. This theory offers a useful framework for understanding human behavior, particularly in the contexts of group dynamics, intergroup relations, and the formation of a shared sense of identity. Essentially, Social Identity Theory focuses on three fundamental processes: categorization, identification, and comparison [27, 2, 30].

- Categorization

The initial phase in Social Identity Theory involves categorization, wherein individuals classify themselves and others into different social groups based on common characteristics. These characteristics may include a broad range of elements such as nationality, ethnicity, religion, occupation, and interests. Categorization serves as a fundamental aspect of human cognition, simplifying the complex social landscape by creating distinctions between the "us" (the in-group) and the "them" (the out-group). This process of categorization can lead to both positive and negative group biases,

profoundly influencing how individuals perceive themselves and those belonging to different group [20, 7].

- Identification

Following the self-categorization into a specific social group, individuals initiate the process of affiliating themselves with that group. Regarding to SI theory, a part of an individual's self-concept is shaped by their association with this group, making the group identity an integral element of an individual's self-perception. The extent of identification can manifest in various forms, ranging from a casual recognition of group membership to a robust and emotionally charged attachment to the group. The strength of this identification significantly influences how individuals perceive their in group and impacts their behavior towards both in groups and outgroups. Strong identification often leads to in group favoritism, wherein individuals exhibit a preference for their own group [17, 8].

- Comparison

The third stage in the framework of Social Identity Theory involves the process of comparison, which consists of contrasting one's in-group with outgroups. This comparative process serves the function of enhancing the positive distinctiveness of the in-group [3]. Essentially, individuals frequently strive to emphasize the attributes and achievements that distinguish their group and present it as superior to other groups. This comparative process can result in the reinforcement of in-group bias, where individuals exhibit a more favorable view of their own group and a less favorable view of outgroups. The scope and characteristics of the comparison process can fluctuate, influenced by factors such as the social context, group dynamics, and the perceived significance of group identity in a given situation [3, 7]. To realize, SI Theory furnishes a comprehensive conceptual framework for comprehending how people categorize themselves and others into social groups, identify with these groups, and engage in comparative processes that influence their attitudes, behaviors, and interactions with various groups. This theory has been pivotal in elucidating a broad spectrum of social phenomena, spanning from intergroup conflicts to the formation of national and cultural identities. Understanding these processes is imperative for addressing concerns related to prejudice, discrimination, and fostering social cohesion in diverse societies [27, 2].

5 Methodology

The methodology employed in this study utilizes a quantitative approach, entailing the gathering of data through structured surveys and questionnaires to acquire numerical insights into participants' attitudes and perceptions. These surveys will be conducted online, ensuring widespread accessibility and efficient data collection. Furthermore, qualitative data will be acquired through in-depth interviews and

content analysis of pertinent documents, enabling a more profound exploration of the underlying factors and contextual influences shaping participants' viewpoints.

5.1 Participants

Utilizing a purposive sampling approach, a group of three hundred (N = 300) undergraduate students was chosen from a variety of programs at Zarqa University. This sample was well-balanced in terms of gender, with 212 females and 88 males, ensuring a diverse representation. The students hailed from various academic disciplines and backgrounds, contributing to the diversity within the study group. Each member of the sample actively participated in the research by responding to the questionnaire items, resulting in 300 fully completed responses that were subsequently subjected to analysis. This method not only maintained gender balance but also guaranteed diversity in educational backgrounds, ultimately bolstering the reliability of the research findings.

5.2 Instrument

In this study, we employed a five-point Likert scale (ranging from 5 for "strongly agree" to 1 for "strongly disagree") to assess participants' responses. This approach facilitated a detailed evaluation of attitudes and perceptions, enabling a nuanced exploration of viewpoints regarding the topic of national belonging. The unique Likert scale, encompassing negative and reversed items, aimed to encompass a broad range of opinions on the subject.

5.3 Data Analysis and Findings

Partial Least Squares (PLS) analysis stands as a powerful technique for data analysis. It excels in managing intricate, high-dimensional data by pinpointing crucial factors that elucidate both independent and dependent variables. PLS streamlines data comprehension and contributes to the creation of predictive models. This approach finds extensive use in diverse domains, empowering researchers to derive valuable insights from intricate datasets to enhance decision-making and advancement.

Evaluation of Assessment Model

Al-Tarawneh [6] underscore the importance of survey verification in PLS, analyzing both reflective and formative constructs for quality assurance [6]. The assessment involves reliability and validity checks. In the examination of the measurement model (Fig. 1) with 16 reflective indicators, item CA3 displayed a factor loading below 0.50.

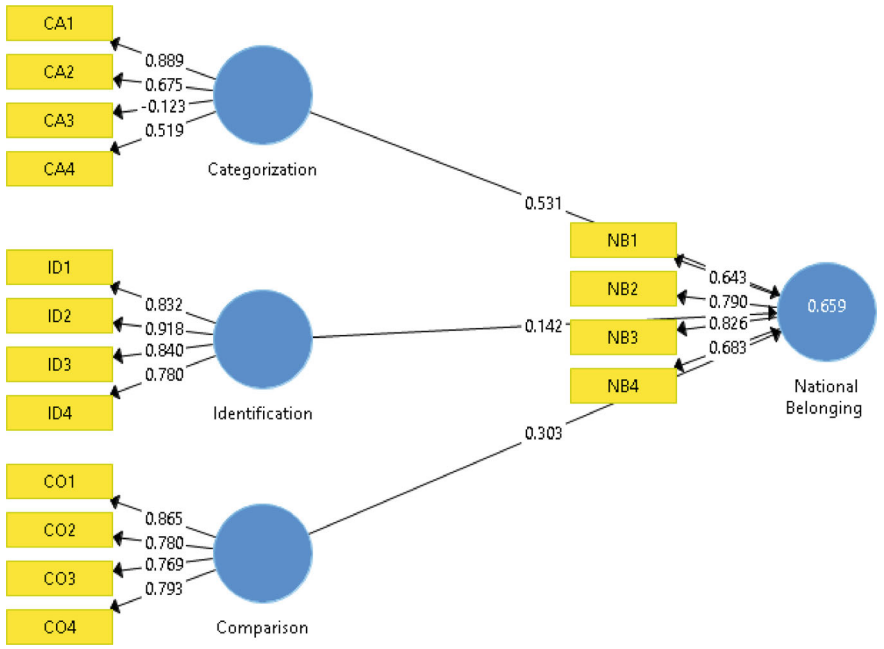


Fig. 1 Analysis of assessment model

In line with the suggestions of Hair et al. [18], indicators within the 0.40–0.70 factor loading range were eliminated if their removal increased the composite CR beyond the recommended threshold.

As presented in Table 1 and Fig. 1, the assessment of convergent validity for each construct was conducted using the Average Variance Extracted (AVE). Convergent validity measures the extent to which a given measure correlates positively with other measures of the same construct (Hair et al. 2016). In this study, we adhered to the recommended minimum AVE value of 0.5, as suggested by prior research [6, 29]. The results reveal that identification achieved the highest AVE value (0.713), while categorization attained the lowest satisfactory AVE value (0.382). In accordance with the findings of Al-Tarawneh [6], when the composite reliability surpasses the 0.4 threshold and the Average Variance Extracted (AVE) registers beneath the standard 0.5 level, it is considered suitable to dismiss the AVE in this particular scenario. In summary, all these values satisfied the criteria deemed acceptable for their convergent validity. Moreover, the CR values, as presented in Table 1, were utilized to gauge the internal consistency of the individual constructs. Although it is suggested that the minimum benchmark value should be 0.70, a higher CR value is preferable. In this study, the CR values for each construct range from 0.609 to 0.908, all of which surpass the benchmark value. According to the specified criteria, the variables have shown sufficient convergent validity.

Table 1 Results of measurement model

Variable	Items	FL	CR	AVE > 50%
Categorization	CA1	0.889	0.609	0.382
	CA2	0.675		
	CA3	0.123		
	CA4	0.519		
Identification	ID1	0.832	0.908	0.713
	ID2	0.918		
	ID3	0.840		
	ID4	0.780		
Comparison	CO1	0.865	0.878	0.644
	CO2	0.780		
	CO3	0.769		
	CO4	0. 793		
National belonging	NB1	0.643	0.827	0.54
	NB2	0.790		
	NB3	0.826		
	NB4	0.681		

In this study, the assessment of discriminant validity for the examined constructs followed the criteria proposed by Fornell and Larcker [4]. Discriminant validity is established when the average square root of the extracted variance for a particular construct exceeds the correlation values with all other variables (Hair et al. 2016). As indicated in Table 2, in line with the Fornell and Larcker standard, the findings confirm the sufficient discriminant validity of each construct, as the squared correlation for each construct is less than the average variance extracted. Furthermore, the Heterotrait-Monotrait Ratio (HTMT) functions as an indicator of the inter-construct correlation, aligning with the creation of de-attenuated construct scores. A threshold value of 0.9 was applied. As illustrated in Table 2, the study concludes that there is no indication of a lack of discriminant validity, and all constructs meet the specified criteria.

Table 2 Assessment of discriminant validity [4]

	Categorization	Comparison	Identification	National Belonging
Categorization	0.618			
Comparison	0.527	0.803		
Identification	0.451	0.323	0.844	
National belonging	0.754	0.629	0.479	0.739

The results of the study imply that the seven constructs effectively measure their respective attributes, backed by strong empirical evidence confirming reliability, convergent validity, and discriminant validity.

Evaluation of the Structural Model

In this study, the structural model illustrates causal relationships among constructs (see Fig. 2). The assessment involves testing six research hypotheses using path coefficients (ß), standardized metrics ranging from − 1 to + 1. Values close to + 1 suggest a strong positive association. Significance is determined by a t-value surpassing a specific threshold (e.g., 1.96 for $p < 0.05$).The assessment of the structural model's quality involves considering the determination coefficient and the significance level of path coefficients (beta values). A higher Adjusted R-squared suggests an improved fit for the structural equation, indicating a more robust ability to elucidate the exogenous variable through endogenous variables [18]. The findings derived from the analysis of the research hypotheses in Fig. 2 and Table 2 underscore the validation of all the proposed research hypotheses. In a corresponding vein, the results indicate that Categorization wields a substantial and favorable influence on National Belonging (ß = 0.498, t = 12.395, $p < 0.05$), thereby corroborating H1. Furthermore, the data suggest that Identification also exerts a positive effect on National Belonging (ß = 0.156, t = 3.476, $p < 0.05$), offering support for H2. Similarly, the findings demonstrate that Comparison positively contributes to National Belonging (ß = 0.300, t = 7.329, $p < 0.05$), affirming H3.

6 Discussion

The evaluation of the structural model's quality is contingent upon the determination coefficients and the significance of path coefficients (beta values). A higher adjusted value signifies an enhanced ability to clarify the influence of endogenous variables on exogenous variables, thus reinforcing the structural equation model, in line with the research conducted by Joe F. Hair and colleagues in 2011. Consequently, the analysis serves to affirm the validity of all the proposed research hypotheses, underscoring that the relationships under examination receive substantial support from the dataset [18, 19]. In terms of the impact of variables on National Belonging, the results can be outlined as follows: the variable associated with "Categorization" exerts a substantial and favorable influence on National Belonging (ß = 0.498, t = 12.395, $p < 0.05$), indicating that the concept of categorization plays a significant role in shaping individuals' sense of national belonging, thereby corroborating Hypothesis (H1). Similarly, "Identification" has a positive effect on "National Belonging" (ß = 0.156, t = 3.476, $p < 0.05$), implying that how individuals affiliate with specific groups or categories contributes to their sense of national belonging, providing support for Hypothesis (H2). Additionally, the act of "Comparison" is shown to positively contribute to "National Belonging" (ß = 0.300, t = 7.329, $p < 0.05$), indicating that evaluating oneself or one's group in comparison to others is another factor influencing

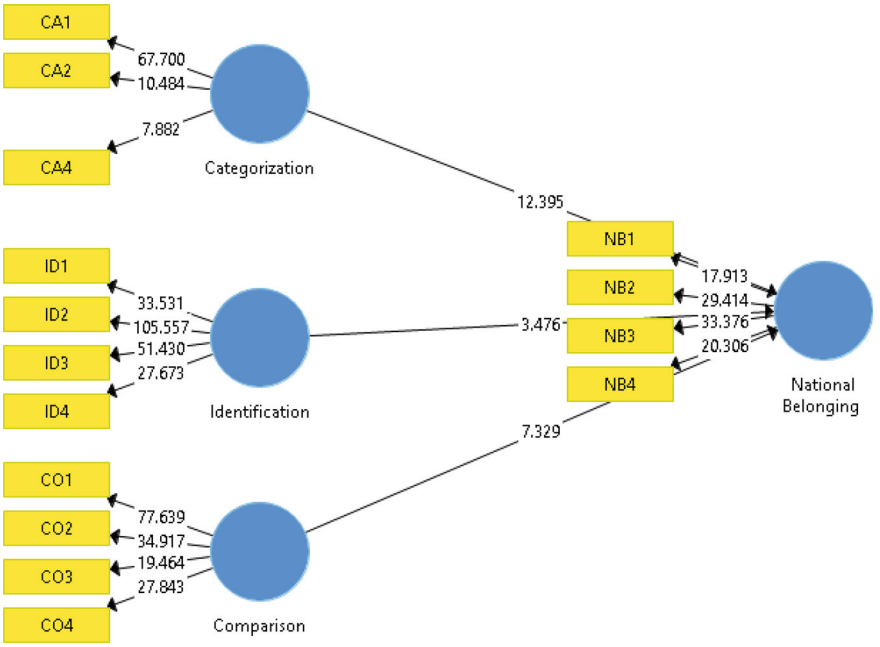


Fig. 2 Evaluation of the structural model

Table 3 Hypothesis testing

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values
Categorization → national belonging	0.498	0.499	0.040	12.395	0.000
Comparison → national belonging	0.300	0.299	0.041	7.329	0.000
Identification → national belonging	0.156	0.160	0.045	3.476	0.001

an individual's sense of national belonging, affirming Hypothesis (H3). In summary, the SEM analysis underscores the significance of these factors in shaping individuals' sense of national belonging, aligning with the study's hypotheses and underscoring the importance of these variables in comprehending how individuals develop a sense of national belonging, particularly within the framework of the Social Identity Theory perspective. This paper imparts valuable insights into the factors that impact national identity and belonging, particularly within an educational context [12, 14, 32].

6.1 Implications and the Future of National Identity Studies

The pivotal role in shaping the national identity and cultivating a feeling of affiliation among individuals is played by courses in national education [29]. This underscores the importance of developing successful educational approaches that encourage a favorable and encompassing national identity [10]. Educators and policymakers ought to explore the integration of techniques that utilize categorization, identification, and comparison principles to nurture a robust feeling of national allegiance [22]. The study's affirmation of Social Identity Theory's impact on national belonging underscores its practical significance in comprehending and improving national identity. Scholars and practitioners can apply these findings to develop programs that strengthen national cohesion. Policymakers can use these insights to guide the creation of inclusive national education curricula and policies, fostering a global mindset while honoring cultural diversity. The paper establishes a foundation for evidence-based policy formulation, highlighting the importance of cultural integration in advancing national identity [15, 22]. Policymakers and educators should explore methods to enhance the effectiveness and inclusivity of the cultural integration process. In the contemporary global context, these results hold significance for countries navigating the alignment of robust national identities with principles of global citizenship. The paper suggests an approach that promotes both national belonging and intercultural understanding, fostering global collaboration. Furthermore, it lays the groundwork for future research in education, psychology, and social identity, prompting investigation into the prolonged impacts of national education courses on identity and unexplored variables beyond the study's scope. In brief, this paper bears profound implications for educational strategies, policy formulation, and a deeper comprehension of the formation of national identity. It imparts invaluable insights into the intricate mechanisms of national belonging and establishes a strong basis for prospective research and well-informed decision-making in the realm of national education and identity [11, 15, 25].

7 Conclusion

The study underscores the significant impact of national education courses and Social Identity Theory on shaping individuals' national identity and sense of belonging. The results imply potential improvements in educational practices and policy formulation, highlighting the value of evidence-based approaches. Additionally, the research enhances our comprehension of the mechanisms influencing national identity, laying the groundwork for future studies in education, psychology, and social identity. In conclusion, it aids informed decision-making in national education, promoting a unified and inclusive national belonging tailored to our progressively globalized world.

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The Principle of Publicity in Criminal Trials: Legal Perspectives and Technological Integration



Lubna Ahmed Kreishan

Abstract Openness is one of the basic principles of the criminal process, ensuring the transparency of the justice system. This article will explore the role of technology in integrating process transparency into the legal framework. In particular, technological progress in digital tools and platforms to facilitate the open conduct of hearings and public access to trial information will be assessed. Current practices will be analyzed to identify how the principle of public access to trials in criminal law works and the impact of technology in increasing the transparency of procedures. Moreover, the article will focus on measures and protocols guaranteeing the right to public participation and the consequences of violating the transparency of the process. By incorporating technology into the analysis of the criminal justice process, this article will report on the potential of digital innovations to enhance the transparency of judicial processes.

Keywords Transparency · Criminal trials · Legal guarantees · Open court sessions · Publicity of criminal trial

1 Introduction

According to the transparency of trials, court cases are held in public, and people can come to observe and participate in the trial. One of the aims of making trials open is to make sure that all participants have a possibility to testify about their innocence, whereas the audience is a direct witness to justice not being miscarried and judges not treating any person with prejudice. Transparency itself helps society believe in just decisions of courts and advocates human rights principles and democratic ideas on how state powers should be organized [1].

The concept of trial transparency refers to the fact that court proceedings and decisions about guilt or innocence should be open and accessible to everyone, with

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any member of the public allowed in court and audiovisual recording permitted. Furthermore, this term implies informing accused individuals, attorneys, and other concerned parties about the hearing schedule, which ensures their active involvement in the judicial procedure allowing them to defend their legal rights. Transparency in criminal trials is an idea of legal principle through which court proceedings and verdicts in criminal cases are conducted openly, publicly, and in a non-secret manner. The purpose of such a system is to safeguard the transparency of the justice procedure as well as the protection of the rights of both accused and victims. Transparency manifests itself by the involvement of spectators during court sessions, giving advance notice to lawyers and other interested parties about the trial schedule, as well as public announcements about judicial resolutions.

Trial transparency is important due to its contribution to the judicial system in establishing justice and protecting human rights. By having open trials, everyone can watch for any irregularities or human rights abuses, and if there are some, take actions against them and be sure that they will be taken. Moreover, transparency improves public trust towards the courts and their administration of justice and promotes citizen engagement with trials as well as compliance with laws. Trial transparency is a basic right and fundamental principle within the legal system, in which it ensures visibility of the trial process, building confidence and trust in judiciary services, allowing defendants and victims their right to be heard and to take part effectively. In addition, transparency facilitates responsibility for actions thus precluding chances of manipulating justice; as a result strengthening the rule of law in society and making possible freedom of speech and people's right to information access [1].

2 Principles of Trial Transparency in Criminal Law

The pillars of trial transparency derive from some basic tenets. In the first place, these involve the public's right to witness courtroom proceedings and check if the system is fair enough. Secondly, they provide for the defendant's right to be defended by a counsel as well as his/her participation in the process of evidence taking. One aspect of judicial transparency and accountability is the practice of releasing judgments, which contributes to the access of information by the public and trust towards the court. Another approach is documenting hearings with audiovisual materials in order to maintain strictness and fairness in the legal process; also preserving the interest of all parties.

2.1 Legal Foundations of Trial Transparency

The question of the influence of trial transparency on defendants' rights is quite difficult, since these rights have been violated in several respects. Defendants should be given an opportunity to present their evidence and arguments openly during court

hearings in order to satisfy the principle of equality arms between prosecution and defendant. Moreover, it is necessary to provide the defendant with the right to openly cross-examine witnesses and experts for confirming their honesty and objectivity in relation to the evidence against them. In addition, the defendant must possess information about all stages of a case from documents to its results; these guarantees are provided for due trial transparency in their specific application as follows.

Right of the Public to Attend and Participate in the Trial

One of the most essential elements of trial transparency in criminal law is the public's right to attend and participate in the proceedings. Members of the public are usually allowed to be present during court hearings unless there are special circumstances linked to fairness or safety and protection of state secrets. Furthermore, everyone who wants to do so can take part in a trial by hearing, giving evidence and testimony, as well as providing any available evidence within legal limitations. These conditions are subject to specific legal regulations and penalties provided for by the criminal law.

Right of the Defendant to Know the Charges against Them

One of the basic rights of the accused is the right to know the basis of the accusation against him. This right falls within the principles of public process. This means that, immediately after arrest, the accused must be made aware of all the charges against him in detail and must be given a sufficient opportunity to become fully familiar with the charges and the evidence supporting them. In this way, the basis for an effective and fair defense will be prepared, and it will also be a valuable measure to protect against violation of the accused's rights during the proceedings [2].

Right of the Defendant to Defense and Presentation of Evidence

In criminal law, the presence of defense and evidence are fundamental rights of a suspect and are linked to justice, which means the greatest possible transparency at the trial stage. An accused who is presumed innocent has the right to present any evidence or explanations, testimony and views he has, or to seek assistance from a lawyer for this purpose. In addition, the accused must be given the opportunity to testify to prove his innocence or, if necessary, justify his act. These rights help make the justice system more democratic and maintain the rights of defendants during trial.

Right of the Defendant to Question Witnesses and Experts

The law grants the accused, in the ordinary course of the trial, the right to question witnesses and experts in order to establish the truth and facts that would support the accused's defense. This right is clearly reflected in the legal precedent set out in Jordan's penal codes to regulate this issue as a result of its judiciary's efforts to bring fairness and equalize the scales in favor of the parties to criminal proceedings. This strengthens one of the required principles of justice—transparency of the process—and guarantees a legally binding final judgment based on proven evidence [3].

3 Guidelines for Trial Transparency

The Transparency of Trials Laws are the articles and principles that regulate and guide the rights and obligations of participants regarding the publication, openness, and publicity of hearings. These articles contribute to increasing opportunities for fairness, justice and human rights to learn about legal issues and to participate in a fair trial before the courts. These articles are: the right of the public to be present at the trial, the accused's right to defense, judgments and recording of trials.

Right of the Public to Attend

There is a law that gives the public the right to follow criminal trials, ensuring that judicial measures are transparent and fair. Apart from the media, anyone could participate in all hearings and debates on a given case in the session hall. Attendance rules are specified in the internal regulations. These provisions list and describe the procedure and the obligations of the person authorized to be an observer of the hearing [2].

Right of the Defendant to Full Knowledge of the Charges

The right of the defendant to have access to complete information about their charges is one of their fundamental rights in the process of a criminal trial. This entitlement encompasses the knowledge of details and nature of crimes laid against them and also evidence adduced before the court as well, which helps them to mount a proper defense and counter any weaknesses in the case presented by the prosecution. To ensure that the trial is fair, information should be provided to the defendant with clarity and completeness thus preserving the right to fair defense.

Right of the Defendant to Defense

As per the law of Jordan, one of the defendant's fundamental rights is the right to defend him/herself in a trial, and this right is key for ensuring justice in criminal cases. The accused right to defense includes seeking a legal expert, introducing all defenses they consider necessary, questioning prosecution witnesses and witnesses, providing evidence or testimonies that deny the charges made against them. Also, it should be noted that every defendant should have an equal chance of defending themselves with all legal means available to them.

Right of the Lawyer to Defend Their Client Publicly

The basic right of a lawyer is that he/she must argue publicly in support of his/her client in criminal cases. To guarantee the openness and effectiveness of judicial work it is necessary to provide a lawyer's right to open action, as well as a meaningful defense. It is counted as one of the chief basic guarantees required for achieving justice and for safeguarding the rights of the accused. During the trial, the attorney has to have the ability to provide effective means of defense and express their opinions freely. The lawyer's right helps maintain parity between parties; besides, an individual

under investigation should be provided with an equitable opportunity to defend him/herself [3].

Right of the Press to Cover Court Sessions

An important right the press enjoys during criminal trial proceedings is the ability to cover court sessions. The role of the press in informing the public and providing an objective description of courtroom proceedings is critical and crucial. Achieving this right requires striking a balance between the press's freedom to obtain information and an individual's right to a fair trial, while taking into account the protection of confidential data as well. Exercising this media freedom guarantees the open work of the judiciary system where defendants' rights and the public have access to justice-related information [4].

Publication of Judicial Judgments

According to Jordanian laws, all judicial judgments are required to be public and recorded as part of the case's archive. Judicial judgments are released and published immediately after issuance to be appropriate and within reach of the general public. They are supposed to have information about the case, the decree reached by the court, reasons for such a decision, as well as any form of punishment that could have been applied to the accused person. The publishing of judicial judgments is among various procedures used to enhance transparency and accountability in the Jordanian justice system.

Documentation of Court Sessions

In the light of transparency regulations in Jordanian law, it is obligatory to ensure that court proceedings are properly and completely documented. This recording process includes documenting conversations, testimonies, and evidence produced during the hearing. Court sessions are recorded so that a reliable account of everything that transpires during the trial can be kept for subsequent use if necessary, such as an appeal or review of judgments. Documenting court sessions is an essential factor in upholding the rights of parties involved in legal cases.

The concept of transparency in criminal trials in Jordan is regulated through the control and oversight of the judiciary authority. These bodies are mainly represented by criminal courts, where court hearings take place in a public atmosphere and can be attended by anyone. The judge assumes the position of the leader of the trial process who must ensure its transparency at every step. Additionally, the prosecution authorities have an essential function as they ensure transparency by conducting public prosecution to represent society in a trial and providing necessary evidence against the defendant [4].

4 Exceptions to Public Trials in Law

In Jordan, there are certain circumstances in which the public trial principle is not followed, and exceptions can be made to this rule. A few of these situations include when some matters must be heard in full secrecy so that they cannot be brought up for discussions during public trial sessions. These would be security cases, national defense cases, and military matters. Furthermore, some instances involving domestic violence and children or victims of abuse are out of bounds to safeguard their confidentiality and treat such cases privately within four walls without any publicity.

4.1 Exceptions to Publicity

Some cases in Jordanian law are exempted from the principle of public trials, including:

- State Security Protection: The exceptions include security cases, national defense cases, and military matters. In these circumstances, court proceedings are carried out under strict confidentiality so as not to compromise the interests of these matters or national security. These cases follow unique protocols outlined by Jordanian legislation.
- Justice Interest Protection: The protection of justice interest in Jordanian law is aimed at fairness and ensures that the law is administered properly. Consequently, certain cases under trial are out of the public eye because it would be against the interest of justice. These exemptions are about trials that may hinder the gathering of evidence or put witnesses or parties at risk. Appropriate actions in this matter should be performed according to guidelines provided by Jordanian laws and judicial authorities.
- Children and Victims' Privacy Protection: In Jordan, special attention is given by the law to ensuring that the rights of children and victims are protected during trial. Consequently, publicity is kept at bay when there are cases of domestic violence, child abuse, or victims. Such cases are handled privately and in secret chambers with restricted access by the public aiming to secure the safety and privacy of these innocent people. This increases the chance for children and victims to tell their testimonies without unnecessary external pressure and threats [5, 6].

Finally, it is also necessary to clarify the transparency of the process, that is, especially now when issues regarding confidentiality and veracity during the process can be highlighted: perhaps there are issues in the sense that how can veracity or the assurance of confidentiality during or after trial process or both, how it would best be done, and so on; most importantly, it is important that all information submitted to the hearing is treated with the utmost confidentiality and is consistent with the rights of all interested parties, including the right to hear cases that concern fairness and the development of objectivity in looking at questions of truth [7].

- **Confidentiality and Trustworthiness Issues in Trials**

In addition to confidentiality and credibility, hearing procedures must also be understood as a fundamental element of judicial "dignity" requiring transparency. It is important for Jordanian judges, lawyers and investigators to maintain the secrecy of their duties. All information related to the examination should be retained to ensure the protection of the confidentiality of all persons participating in the examination, and in particular to prevent the disclosure of confidential information in a way that would enable it to be recognized and disrupt the course of the hearing.

- **Secret Investigations and Their Impact on Trial Transparency**

The secret investigations may be a hindrance to the fairness and openness of the trial in Jordanian criminal law. Investigators might choose to pursue covert operations to uncover crimes and gather evidence. Nevertheless, it is important that these secret investigations do not interfere with the rights of the defendant nor undermine the soundness of the judicial procedure. The ability to strike a balance between conducting secret investigations and maintaining transparency during the trial is necessary to preserve the principles of justice as well as equality before the law.

- **Balancing Trial Transparency and Protecting the Privacy of Parties**

Among other challenges to establishing a culture of process transparency in Jordanian criminal law, a key challenge is striking a balance between the right to process transparency and the right to privacy. Parties attending the trial have the right to their privacy, reputation, and dignity that should be safeguarded. However, on the other hand, the general public has a right to information on how the trial is being conducted and proceedings taken therein. Therefore, mechanisms and legal frameworks ought to be put in place to ensure an equilibrium between these conflicting rights so that no party gets prejudiced and justice is not jeopardized either [7–9].

4.2 Impact of Trial Transparency on the Justice System

One of the key considerations in relation to trial transparency is safeguarding the interests of society. Transparency is an ingredient in guaranteeing that the process is fair, free from bias, and balanced so that it can be trusted by the public; as such, individuals can have a chance to take part in, see, and ascertain if justice is reached. On one hand, transparency establishes confidence in the judicial system and on the other hand ensures everyone's right to information relating to legal affairs, including access to legal documents. In addition, transparency serves as a tool in preventing manipulation or corruption in judicial proceedings since any forms of violations or abuses might be discovered by witnesses' presence and public monitoring over the judicial process. Some of the impacts that emerge in the Jordanian judicial system following trial transparency benefit the justice system. To illustrate, it creates awareness and trust in the judiciary as everyone, including the general public and the

media, can be in a position to follow proceedings hence ensuring the fair delivery of justice. Moreover, transparency at the trial level protects the rights of the accused and victims equally, enabling them to present their defense or decide their fate in public view. Moreover, it helps limit the scope for perverting the administration of justice while putting pressure on the rule of law.

Enhancing Transparency and Confidence in the Judiciary

Taking steps to increase transparency in processes supports efforts to increase the openness and credibility of the Jordanian judicial system. Indeed, if trials are open to the public and the media, transparency and the rule of law will be preserved by making open justice one of the main goals of public trials. More importantly, the public can better monitor judges' decisions and thus ensure their credibility. This strengthens confidence in the Court's judgments because the outcome of the legal process appears to be consistent with the rule of law. Maintaining transparency increases the credibility of court decisions and serves society's interest in preserving their right as citizens to seek justice. Therefore, the judicial process must also be transparent, not opaque, to ensure public participation, observation and the ability to verify the legality of the judicial process. This allows for transparency that will help avoid attempts at impunity or manipulation of the process by the interests of the parties, because there are witnesses who know exactly what is happening and observers themselves who would gain confidence in the justice system if they could be a fly on the wall in court when justice will be meted out. After all, transparency also means that everyone must have access to legal information and the right to be an observer to see how the justice process is carried out (or not). Transparency in the administration of justice [8].

Protecting the Rights of the Accused and the Victims

This is considered to be one of the important ways to protect the rights of the accused and the victim in the justice system. This includes the ability to demonstrate an open and honest legal defense, where the defendant or his or her lawyer can openly argue in court and defend his or her rights and allegations, while the victim can be present in the courtroom to testify during the hearing and file a motion to assert your rights. To guarantee these entitlements, it should be ensured that all participants receive equal due justice for a fair trial. In trials, maintaining a balance between transparency and safeguarding privacy is a complicated issue. In spite of the huge value that transparency has in safeguarding public interest, it is crucial to accord rights and privacy of those involved in a trial. The judiciary, therefore, needs to set up the requisite safeguards that protect an individual's right to privacy, which may include not revealing personal or private information about someone without their consent. There must be a fine line between openness and an individual's protection so as not to let anyone be slandered or negatively thought about unjustly [9].

Reducing Opportunities for Justice Manipulation

To a considerable degree, the Jordanian system of judiciary is less open to abuse of trial visibility, as public participation and media scrutiny are factors that hinder

manipulation or undue influence on judges, thus making it hard for any party to subvert the judicial process. In this way, the principle of legal responsibility becomes more solid due to the fact that the implementation of justice will not depend on any manipulation or bypassing [10].

Transparency forms a foundation that ensures the trustworthiness of judicial processes. Public visibility and observation of trials make the judiciary answerable to society, thereby discouraging any potential misappropriation or diversion from the right course and establishing public confidence in the system. Transparency also makes judges accountable and subject to oversight. Furthermore, members of the public can attend proceedings, learn about case details, which helps in promoting transparency and laying down the basis for a fair and independent judicial system.

When it comes to the trial transparency law in Jordan, you can find very strict punishments that convicted individuals might face. These penalties are criminal as well as disciplinary and involve imprisonment, financial penalties, and possibly even being stripped of their professional rights should they go against the rules of a specific justice system. All these penalties are to maintain trial transparency and to ensure there is a fair and transparent judicial system in Jordan.

On the other hand, it should be mentioned that the adoption of trial transparency within the Jordanian legal system is an initiative that has faced many problems. One of the challenges is exerting pressure by public opinion; media coverage and people's reactions may interfere with court proceedings and judgments. Furthermore, it must be ensured that the lives and safety of witnesses as well as judges are protected in order for there to be trial transparency [11].

It is necessary to establish efficient procedures and mechanisms that ensure the safety of witnesses and judges so as to prevent any harm from threats or manipulation on trial fairness. Meanwhile, another significant challenge in ensuring open trials is the provision of all essential resources—the building and maintenance of well-equipped facilities, robust infrastructure, and properly trained staff capable of ensuring appropriate conditions for holding a trial respecting its transparency requirements [12].

5 Conclusion

To conclude, it is evident that our research serves as a crucial reminder about the significance of trial transparency in helping to establish justice and prevent injustice and corruption. Transparency allows trials to be watched by the public, media, and NGOs, which will help hold the judiciary system accountable for law enforcement. Further, transparency promotes trust in the judiciary system and enables parties involved, such as accused persons, victims, and also members of the public, to be part of the trial proceedings with a quest for discovering the truth. The right to trial transparency is one of the basic principles of criminal law that aims at ensuring fair and just trial proceedings for everyone concerned.

5.1 Results

- The study has made it clear how trial transparency is essential for the fair and transparent rights of the accused in criminal trial processes.
- Of all the factors influencing the degree of transparency of the process, the greatest influence is exerted by the provisions of the judiciary and the constitution, which determine whether the process should be treated as transparent and fair or not. Judicial legislation determines whether there should be standards and principles to be followed in public proceedings. Meanwhile, constitutional law protects the right of citizens to openly witness a court hearing. Legal culture and social phenomena in society are also very important to make the process transparent.
- Similarly, technology and electronic messaging influence the openness of processes. Recent developments such as live webcasting of court sessions can be quite beneficial in increasing public engagement and increasing levels of transparency and fairness.

5.2 Recommendations

To enhance trial transparency in Jordanian law, several important points should be considered:

- Transparency is considered a key factor in ensuring a fair process—all processes should be made public. One way this could be achieved is by breaking down complex legal terminologies and organizing workshops where members of the public can learn about open trials.
- To make sure that trial transparency is in place and respected, judges and lawyers need to be provided with training on how to conduct public hearings in a manner that balances the rights of privacy and security with the interests of involved parties by developing necessary skills.
- The improvement of the media's role in trial transparency is vital. Journalists should be given easy access to the courtrooms and also accurate information about the cases so that they can report on judicial sessions truthfully and effectively.
- It is crucial that trial transparency becomes an issue of public concern. The population needs to be informed about the significance of open hearings in the Jordanian legal system. The promotion of awareness of the functionality of courts and the importance of justice through transparent proceedings can help to generate trust towards the judicial system and enable justice, thereby leading to justice, therefore via building educational programs and media campaigns that point out the value of open trials as well as their impact on promoting equality and justice in society.
- To train judges and lawyers on ensuring trial transparency, this includes imparting to them the requisite set of skills and knowledge they would need to plan for and

manage court sessions that concern cases related to criminal actions. Judicial discipline can be improved as a result of these trainings, while justice may also prevail in the courts; thus establishing a more trustworthy Jordanian judicial system

- The issue of empowering the media to deliver more transparent court processes is important. In Jordanian law, the media has a key role in the promotion of trial transparency. One way to make it possible is by expanding the media's involvement through covering all judicial sessions fairly and impartially in detail. Furthermore, cooperation among journalists and judges should be developed so that judges are able to provide necessary information for objective reports about any case. The balanced relation between courts and media may ensure fairness and impartiality in the Jordanian justice system.

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The Impact of Job Benefits on Employee Performance: An Empirical Study



Khaled Alzeaideen and Mohammed Nayef Ahmed Al-Zawahreh

Abstract This research aims at investigating the effect of job benefits on employee performance. The approach used was descriptive-analytical, and its data were collected through questionnaires distributed to a sample of employees amounting to 10,283. Five hundred electronic questionnaires were distributed, with a return of 418 questionnaires, out of which 410 were valid. In this study, both material and moral job benefits were evaluated concerning their impact on job performance; the data were then analyzed using the SPSS statistical package. According to these authors, the results found a positive impact of job benefits on employee effort. This study recommends that effective material and moral reward and incentive systems be developed with an emphasis on transparency and fairness in distribution plus boosting the training and qualification of employees by fostering job commitment and job satisfaction through effective communication that recognizes efforts made.

Keywords Job benefits · Employee performance · Employee effort · Incentives

1 Introduction

In the public and private sectors, employee performance is strongly influenced by job benefits, which include financial rewards such as salary bonuses, social benefits such as insurance, and development opportunities that include promotion, transfer, and listening to employee needs [3]. This will make employees feel more engaged in their work and work harder, leading to higher productivity and lower turnover [7].

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The impact of employee benefits on employee efficiency cannot be overestimated, as they have a positive impact on the level of employee satisfaction and loyalty to the organization [9]. These benefits include various forms of rewards, including extrinsic incentives such as bonuses and cash benefits, and intrinsic incentives such as social and cultural rewards such as country club membership, promotions and transfers that increase employee morale and career development [5]. These benefits are crucial in determining the level of productivity and quality of work produced, hence the need to provide such benefits to attract and retain highly talented employees in organizations [10].

The aim of this study is to investigate and evaluate the impact of work (employment) benefits on employee motivation and performance improvement, especially of new hires in Zarqa Province. The study also aims to examine how job benefits influence various aspects of job performance, such as productivity, job satisfaction, and organizational loyalty [6]. Additionally, the study will examine how these benefits contribute to reducing turnover rates, a significant challenge faced by numerous public institutions [8]. Through the analysis of data collected from employees in Zarqa municipalities, this research aims to provide valuable recommendations for enhancing job performance through the implementation of effective job benefits policies. The anticipated findings will not only contribute to the theoretical understanding of the significance of job benefits in municipal work environments but also offer practical insights to policymakers and managers for developing efficient human resource management strategies and administrative practices [4].

1.1 Study Problem and Questions

The study seeks to understand the impact of job benefits and their role in affecting employees by answering the main question: Is there an effect of job benefits, in their combined dimensions (material rewards and incentives/non-material rewards and incentives), on employee performance, specifically employee effort, in Zarqa municipalities? The study will address the following sub-questions:

- Is there an effect of material rewards and incentives on employee effort in Zarqa municipalities?
- Is there an effect of non-material rewards and incentives on employee effort in Zarqa municipalities?

1.2 Importance of the Study

- The study holds scientific importance due to the significant role played by the targeted institutions and their influence on the community.
- The experience of Zarqa municipalities can be transferred to other institutions and municipalities to enhance the development of advanced job benefits systems. This

will effectively encourage the strengthening of these elements, ultimately leading to the achievement of the organization's strategic goals and the promotion of comprehensive local development.

1.3 Study Objectives

The study aims to test the effect of job benefits on employee performance in Zarqa municipalities. Based on this, the study aims to achieve the following objectives:

- To clarify the effect of material rewards and incentives on employee effort in Zarqa municipalities.
- To clarify the effect of non-material rewards and incentives on employee effort in Zarqa municipalities.

1.4 Operational Definitions

First: Job Benefits

Organizations provide their employees with a number of benefits to motivate them to work, improve their satisfaction and increase productivity. These benefits are not only related to their salaries, but also to training and other career development opportunities [9]. The main objective of this study is to investigate the different employee benefits provided in 3 municipalities of Zarqa Province. According to this study, benefits provided by organizations are defined as financial and moral rewards, promotions, training, and other incentives.

Second: Employee Performance

Job performance is measured by how efficiently and effectively employees perform their jobs, and simply put, what the employee does and how well he or she does it. For the purposes of this study, employee performance in municipalities is measured by a number of variables that reflect morale and employees' vigor and enthusiasm for their work.

2 Related Work

In their study titled "The Impact of Incentive Policies on Employee Performance in Companies: A Case Study of a Telecommunications Company in Chad (2018–2022)," Adam et al. [1] sought to investigate how incentive policies affect employee performance in telecommunications companies in Chad over the period 2018–2022. They used the research methodology used and collected data using a questionnaire.

The study's results revealed a significant correlation between incentives and improved employee performance, highlighting the potential for moral incentives to positively impact performance in telecommunications companies [2]. The study's core recommendation highlights the importance of fairness in the distribution of moral and material incentives among employees, as well as the importance of providing training and development opportunities to increase employee performance. By highlighting the importance of motivational policies in improving employee performance and job satisfaction in business organizations, this study can serve as a valuable source.

In their research titled "The Effect of Incentives on Employee Performance," Midoni et al. [11] conducted a study in the state of Adrar to explore the impact of incentives on employee performance. The study utilized a descriptive analytical approach and involved a sample of 75 employees. Data collection was carried out through interviews and questionnaires, and analysis was performed using SPSS28 software. The findings revealed that both financial and moral incentives had a positive influence on employee performance at the state headquarters. The study emphasizes the significance of enhancing financial and moral incentives within the work environment to enhance employee performance. By providing specific recommendations, this study can contribute to the improvement of incentive effectiveness and overall institutional performance in the municipalities of Zarqa Governorate.

The study titled "The Role of Incentive and Reward Systems on Employee Performance in Saudi Primary, Secondary and Tertiary Industrial Sectors: The Mediating Effect of Employee Job Satisfaction" (2023) examined employees' voluntary and involuntary motivation in terms of their performance. The study used a structural equation modeling (SEM) approach on a sample of 216 full-time employees of the Eastern Province of the Kingdom from various public and municipal sectors covering primary, secondary and tertiary industrial sectors. One of the main findings of this study was that incentives and rewards can positively influence employee job satisfaction and, consequently, their performance. This study recommended that local cultural factors should be taken into account when designing incentives and rewards in Saudi Arabia. Overall, the study reveals the impact of incentives and rewards on city employee performance and highlights the importance of employee job satisfaction.

In a research study conducted by Zebua and Chakim [12], titled "Effect of Human Resources Quality, Performance Evaluation, and Incentives on Employee Productivity at Raharja High School." A sample of 30 randomly selected employees from Raharja High School in Cicokul, Tangerang, was used for this study. The survey method, along with path analysis technique, was employed to analyze the relationships between variables and determine the direct or indirect effects of independent variables on the dependent variable. Data analysis was performed using Smart PLS 3.0 software. The findings revealed that the quality of human resources has a positive influence on employee productivity, with a path coefficient of 0.145. Additionally, the quality of human resources positively affects incentives, with a path coefficient of 0.121. It was also observed that incentives have a positive impact on productivity, with a path coefficient of 0.784. However, performance evaluation does not exhibit a positive effect on employee productivity, as indicated by a path coefficient of -0.103. Therefore, it can be concluded that most assumptions in this study, except for one, do

not demonstrate a positive impact. Based on the data analysis results, it is evident that the quality of human resources directly influences employee productivity at Raharja High School.

3 Study Methodology and Procedures

3.1 Study Methodology

In this applied study focusing on the employees of the municipalities of Zarqa Governorate, a descriptive-analytical approach was utilized to examine the influence of job benefits on employee performance.

3.2 Study Population and Sample

All individuals employed within the Zarqa Governorate municipalities make up the study population. The study sample encompasses various positions, including managers, department heads, assistant managers, and employees, resulting in a total of 410 electronically collected questionnaires. The personal and job-related variables are presented in Table 1.

3.3 Data Collection Sources

The primary goal of data collection is to obtain information about the phenomenon under study. The information sources in this study were:

- Secondary Sources: These included books and previous studies, as well as scientific websites that focus on the current study's topic.
- Primary Sources: These included a questionnaire that was developed and tailored to suit the nature of the study. The questions were formulated to represent each dimension of the study to enable measurement.

3.4 Study Instrument

To facilitate the investigation into the correlation between job benefits and employee performance, a questionnaire was created for the employees of Zarqa municipalities. This questionnaire, which consisted of 26 questions encompassing both personal

Table 1 Distribution of the study sample according to personal and job-related variables

Variable	Response	Frequency	Percentage (%)
Gender	Male	265	64.6
	Female	145	35.4
	Total	410	100
Age group	Less than 32 years	126	30.7
	32 - less than 42	130	31.7
	42 - less than 52	115	28
	52 years and above	39	9.5
	Total	410	100
Monthly income	Less than 500 JOD	166	40.5
	500 - less than 750	148	36.1
	750 - less than 1000	69	16.8
	1000 JOD and above	27	6.6
	Total	410	100
Educational level	High school or below	68	16.6
	Intermediate Diploma	51	12.4
	Bachelor's Degree	174	42.4
	Postgraduate	117	28.5
	Total	410	100
Job title	Manager	47	11.5
	Department Head	99	24.1
	Assistant Manager	83	20.2
	Employee	181	44.1
	Total	410	100
Years of service	Less than 5 years	72	17.6
	5–less than 15	141	34.4
	15–less than 25	143	34.9
	25 years and above	54	13.2
	Total	410	100

and job-related factors, was developed using insights from previous studies on the subject matter.

3.5 Validity and Reliability of the Study Instrument

Face Validity

The questionnaire's face validity is determined by the extent to which its items are aligned with the intended purpose of measurement and their appropriate distribution. The instrument's validity is contingent upon how well the items accurately represent the variable being measured. To ensure the questionnaire's validity, a group of reviewers from Jordanian universities were presented with the study instrument. Their feedback, modifications, and observations regarding the questionnaire items and content were taken into account and incorporated.

Reliability of the Study Instrument

The presence of reliability is of utmost importance when it comes to a test or measurement instrument. Put simply, an instrument is considered reliable if it consistently produces identical results when administered multiple times to the same individuals in identical conditions. To determine reliability, the Cronbach's Alpha Coefficient was utilized to calculate the reliability coefficient. A statistically acceptable result is achieved if the coefficient surpasses 70%.

Table 2 shows that all reliability coefficients were greater than 70%, indicating that the study instrument is reliable.

To determine the level of agreement among employees of Zarqa municipalities regarding job benefits and their impact on performance, the following formula was used:

$$\text{Period length} = (5-1)/3 = 1.33$$

The level of relative importance was determined based on the arithmetic mean, according to three levels as follows (Table 3).

Table 2 Internal consistency reliability coefficient

Variable	Number of items	Reliability coefficient (Cronbach's alpha) (%)
Financial rewards and incentives	5	85.2
Moral rewards and incentives	5	84.0
Job benefits	**10**	**88.4**
Employee effort	5	87.7
Employee performance	**5**	**87.7**

Table 3 Level of relative importance for questionnaire items

Importance level	Low	Medium	High
Arithmetic mean	1–less than 2.33	2.33–less than 3.66	3.66–5.00

3.6 Descriptive Statistics for Study Variables

The following section provides an analysis of the study tool's dimensions, including their respective levels and significance. Extracted data such as arithmetic means, standard deviations, and level of importance have been presented in Table 4.

Descriptive Statistics for the Independent Variable (Job Benefits)

The independent variable (job benefits) was measured through two dimensions: (material rewards and incentives; and moral rewards and incentives) in the municipalities of Zarqa Governorate. Below is an analysis of the responses of the sample members to the items measuring these dimensions:

Based on the data presented in the table, there is a significant level of concurrence as evidenced by the arithmetic means, which range from 3.888 to 3.949. Among the dimensions assessed, the highest average score of 3.949 was achieved by the dimension related to material rewards and incentives, closely followed by the dimension associated with moral rewards and incentives, which obtained an average score of 3.888. Overall, the independent variable of job benefits, as perceived by employees in Zarqa Governorate municipalities, received a high average score of 3.919, indicating a strong consensus.

To illustrate the level of job benefits in Zarqa Governorate municipalities for each dimension separately, the researcher extracted the arithmetic means and standard deviations for each dimension as shown in Table 5.

Based on the data presented in the table, it is evident that the first dimension, which focuses on material rewards and incentives, holds significant importance. The overall arithmetic mean for this dimension is 3.949, with a standard deviation of 0.703. Among the specific items in this dimension, "Do material rewards affect the effort exerted by employees in your municipality?" stands out with the highest arithmetic mean of 4.090 and a standard deviation of 0.869, indicating its high relative importance. On the other hand, "Do financial rewards encourage employees to exert more effort to achieve the municipality's goals?" has the lowest arithmetic mean of 3.890 and a standard deviation of 0.898, also demonstrating its high relative importance. These findings lead to the conclusion that implementing a system of material

Table 4 Arithmetic means and standard deviations for the dimensions of (job benefits)

Rank	No.	Dimension	Arithmetic mean	Standard deviation	Relative importance
1	1	Material rewards and incentives	3.949	0.703	High
2	2	Moral rewards and incentives	3.888	0.725	High
Job benefits in Zarqa governorate municipalities			3.919		High

Table 5 Arithmetic means and standard deviations for the dimension of (Material rewards and incentives)

Rank	No.	Statement	Arithmetic mean	Standard deviation	Relative importance
1	1	Do material rewards affect the effort exerted by employees in your municipality?	4.090	0.869	High
2	2	Do financial rewards play an effective role in improving employees' perception of their role in your municipality?	3.940	0.850	High
5	3	Do financial rewards encourage employees to exert more effort to achieve the municipality's goals?	3.890	0.898	High
3	4	Do material rewards affect the overall satisfaction of employees in the municipality?	3.920	0.840	High
4	5	Is the distribution of financial rewards fair among employees in your municipality?	3.900	0.969	High
Material rewards and incentives			3.949		High

rewards and incentives can enhance employee performance in the municipalities of Zarqa Governorate (Table 6).

According to the data presented in the table, the second dimension, which focuses on moral rewards and incentives, was deemed highly significant, as indicated by its overall arithmetic mean of 3.888 and standard deviation of 0.725. Among the specific items, "Do moral rewards encourage innovation and creativity among employees in the municipality?" received the highest arithmetic mean of 3.930 and a standard deviation of 0.936, signifying its strong relative importance. On the other hand, "Do moral rewards affect team spirit and cooperation?" obtained the lowest arithmetic mean of 3.830 and a standard deviation of 0.949, also with high relative importance. From these findings, it can be inferred that the implementation of a moral rewards and

Table 6 Arithmetic means and standard deviations for the dimension of (Moral rewards and incentives)

Rank	No.	Statement	Arithmetic mean	Standard deviation	Relative importance
5	1	Do moral rewards affect team spirit and cooperation?	3.830	0.949	High
1	2	Do moral rewards encourage innovation and creativity among employees in the municipality?	3.930	0.936	High
3	3	Do moral rewards affect the overall satisfaction of employees in the municipality?	3.910	0.891	High
2	4	Is there a balance in the distribution of moral rewards between the administrative and field sections in the municipality?	3.920	0.915	High
4	5	Does teamwork and cooperation enhance the chances of obtaining moral rewards in the municipality?	3.840	0.949	High
Moral rewards and incentives			3.888		High

incentives system in the municipalities of Zarqa Governorate effectively motivates employees to engage in innovative and cooperative efforts, thereby enhancing the quality of services provided by these municipalities.

3.7 Descriptive Statistics for the Dependent Variable (Employee Performance)

The dependent variable (employee performance) was measured through the dimension of (employee effort) in the municipalities of Zarqa Governorate. Below is an analysis of the responses of the sample members to the items measuring this dimension (Table 7).

Table 7 Arithmetic means and standard deviations for the dimension of (Employee performance)

Rank	No.	Dimension	Arithmetic mean	Standard deviation	Relative importance
1	1	Employee effort	3.953	0.700	High
Employee performance in Zarqa governorate municipalities			3.953		High

According to the data presented in the table, employees in Zarqa Governorate municipalities rated the arithmetic mean for the dependent variable (employee performance/employee effort) as (3.953), indicating a strong consensus among them.

To illustrate the level of employee performance in Zarqa Governorate municipalities for each dimension separately, the researcher extracted the arithmetic means and standard deviations for each dimension as shown in Table 8.

According to the data presented in the table, the dimension of the dependent variable (employee effort) was found to be highly significant, as indicated by its overall arithmetic mean of 3.953 and a standard deviation of 0.700. Among the statements considered, "Does recognizing efforts play an effective role in motivating employees to increase their effort?" had the highest arithmetic mean of 4.010 and a standard deviation of 0.805, demonstrating its strong influence. On the other hand, "Do employees in the municipality put in a clear effort?" had the lowest arithmetic mean of 3.830 and a standard deviation of 0.895, highlighting its importance as well. Therefore, it can be inferred that when the higher authorities in Zarqa Governorate municipalities acknowledge and appreciate the efforts of their employees, it leads to higher job satisfaction and serves as a motivating factor for them to exert more effort in carrying out their tasks.

3.8 Normal Distribution Test

To determine if the study data follows a normal distribution, a test known as the normal distribution test is conducted. This test involves examining the Skewness coefficient, which should fall within the range of (±1.96), as well as analyzing the Kurtosis coefficient, which should have values between (±3).

Based on the test data indicated in Table 9, it is clear that the data distribution was normal as no values fell outside the range of (±1.96) in the Skewness test and did not exceed the Kurtosis test values of (±3).

3.9 Multicollinearity Test

The purpose of this assessment is to evaluate whether there is a linear connection between the independent variables in a multiple linear regression model. Its objective

Table 8 Arithmetic means and standard deviations for the dimension of (Employee effort)

Rank	No.	Statement	Arithmetic mean	Standard deviation	Relative importance
5	1	Do employees in the municipality put in a clear effort?	3.830	0.895	High
4	2	Does an effective rewards system encourage increased effort among employees in the municipality?	3.960	0.878	High
1	3	Does recognizing efforts play an effective role in motivating employees to increase their effort?	4.010	0.805	High
2	4	Does administrative support affect employees' readiness to put in extra effort on a specific project?	3.990	0.872	High
3	5	Is there a relationship between overall employee satisfaction and their willingness to put in extra effort in their tasks?	3.970	0.820	High
Employee effort			3.953		High

Table 9 Normal distribution test for study variables

Variables	Skewness	Kurtosis
Material rewards and incentives	− 0.75	0.965
Moral rewards and incentives	− 0.396	− 0.201
Employee effort	− 0.398	− 0.093

is to gauge the strength of this relationship and its impact on the model's ability to distinguish the individual effects of each variable on the dependent variable. The presence of multicollinearity can distort coefficient estimates and compromise the accuracy and dependability of the findings.

The study employed two tests to assess the relationship between variables. Firstly, the correlation matrix test was utilized, which sets a limit of 80% for the correlation

Table 10 Multicollinearity test

Variables	Material rewards and incentives	Moral rewards and incentives	Employee effort	Employee role perception	VIF	Tolerance
Material rewards and incentives	1				1.508	0.663
Moral rewards and incentives	0.580**	1			1.508	0.663
Employee effort	0.428**	0.548**	1			

value between any two variables. Secondly, the Variance Inflation Factor (VIF) test was conducted, which requires the VIF value to be greater than 1 and less than 10, while the tolerance values should fall within the range of 0.1 to 1. The outcomes of these tests are presented in Table 10.

Based on the data presented in the table, it can be observed that the correlation coefficient between the variables' dimensions falls within the range of 0.428–0.548. This range, which is below 80%, suggests the absence of any multicollinearity concerns in the study's data. Furthermore, the table reveals that all VIF values were above 1 but below 10, while the tolerance values ranged from 0.1 to 1. These findings indicate that there are no issues of multicollinearity among the independent variables in the study.

4 Results

1. There is a statistically significant positive effect of professional privileges through (material rewards and incentives) on employee effort in the municipalities of Zarqa Province. This means that as employee motivation increases through material rewards and incentives, the effort put into completing the required tasks increases.
2. There is a statistically significant positive effect of job privileges through (rewards and moral incentives) on employee effort in the municipalities of Zarqa Province. This means that as employees' motivation increases through rewards and moral incentives, the effort they put in increases thanks to recognition from municipalities.

4.1 Recommendations

Based on the results of the study, the following recommendations can be made:

- The study recommends that municipalities in Zarqa Province improve and improve standards for distributing material and moral rewards and incentives in a way that ensures transparency and fairness, which increases employee satisfaction and motivates them to achieve exceptional performance.
- Promote a culture of innovation and creativity in the workplace in municipalities, providing employees with the necessary support to bring forward new ideas and proposals that contribute to the development of services and improved performance.
- Improve the work environment and provide appropriate conditions that encourage positive interactions among employees through effective human resource management and fostering team spirit and cooperation.
- Engage municipal employees in the development and improvement of their municipalities' compensation and incentives policies, offering suggestions and feedback that could improve the work environment.

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The Legal Frameworks for Patent Protection in the Digital Technology Era: An Analytical Study in Light of International Agreements



Omar Al Makhzoumi and Jaber Al-Ghayathin

Abstract This study explores the legal frameworks for patent protection amidst the developments in digital technology, examining the role of international agreements in enhancing global protection for inventors' rights. The study focuses on analyzing the scope of legal protection granted to patents and the impact of the granting state's borders on the cross-border protection of inventions. It also highlights the role of prominent international agreements such as the Paris Convention, the Patent Cooperation Treaty (PCT), and the TRIPS Agreement in providing an integrated framework for global patent protection. The study employed a descriptive-analytical approach to gather data from various sources, including legal texts and academic articles, while analyzing the effectiveness of these agreements in providing comprehensive international protection. The results indicated that effective protection requires patent registration in each country where the inventor seeks protection and that international agreements provide the essential principles needed, such as the right of priority and national treatment, without nullifying previous provisions but rather reinforcing them. The study recommends the need to raise awareness of the importance of international patent registration and to simplify the registration procedures to reduce costs and time. It also called for updating local legislation in member states to align with international principles and enhancing support for developing countries to ensure their ability to effectively protect their inventions within the international framework.

Keywords Patent protection · Digital technology · International agreements · Paris convention · Patent cooperation treaty · TRIPS agreement · Scope of protection · Patent registration

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1 Introduction

The scope of legal protection for patent rights is limited to the borders of the granting state [1]. Accordingly, patent protection does not extend beyond the territory of the state in which the patent is registered, in line with the principle of state territoriality. Consequently, the scope of patent protection is confined to the granting state and does not apply to any other country in the world unless the patent owner expresses a desire to protect their invention in another country. In this case, they must register their invention in the countries where they wish to protect it [2]. From this standpoint, the idea of international protection for inventors' and innovators' rights began to emerge, leading to the establishment of international agreements aimed at providing protection for the registered rights of inventors in all member states of these agreements [3]. The first agreement concluded for this purpose was the Paris Convention for the Protection of Industrial Property, held on March 20, 1883, which has been amended several times, with the latest revision on October 2, 1979. Many countries around the world have joined this agreement, including Jordan, which acceded in 1972 [4], while Egypt joined the agreement in 1950. The member states of this agreement established an international union office in Bern, Switzerland, with the aim of implementing the provisions of this agreement, and it was later moved to Geneva [5]. The agreement includes three fundamental principles for the international protection of industrial property: (1) The right of priority or precedence, (2) The principle of equality between the nationals of the union countries and citizens, and (3) The principle of patent exploitation. Several other international agreements have been concluded to protect industrial property at both the international and Arab levels.

Based on the above, this study seeks to analyse the available legal frameworks for patent protection in light of technological developments in the digital age. It also aims to assess the effectiveness of major international agreements such as the Paris Convention for the PCT, and the TRIPS Agreement in providing effective cross-border protection for inventors' and innovators' rights. The study will examine how these agreements contribute to overcoming the limitations of territorial protection and provide a comprehensive international legal framework, as well as identify current challenges and opportunities to enhance patent protection in the global digital context.

1.1 Objectives of the Study

- Analyze the scope of legal protection for patents.
- Examine the extent to which the legal protection of patents is limited to the territory of the granting state and how this affects the international protection of inventions.
- Review the most important international agreements aimed at protecting the rights of inventors and innovators, with a focus on the Paris Convention, the PCT, and the TRIPS Agreement.

- Analyze the fundamental principles of patent protection in international agreements, such as the principle of priority, national treatment, and the independence of patents.
- Assess the effectiveness of these agreements in protecting inventors' rights and providing the necessary international protection.

1.2 Study Methodology

The study adopted a descriptive-analytical approach to analyze the subject of patent protection. Through this approach, data was collected from various sources such as legal texts and international agreements, along with a review of previous literature and scholarly articles related to patent protection. After gathering the data, the analytical method was applied to examine and interpret the information. The descriptive analysis included providing an accurate description of the concepts and principles of patent protection and determining the impact of international agreements on legal protection.

2 Legal Protection of Patent Rights Established by the Convention of 1883

The Paris Convention is considered the first agreement concluded to protect the rights of creators and inventors. This convention resulted in three fundamental principles for protecting the rights of innovators and creators, which will be discussed in three sections.

2.1 Principle of Priority and Precedence

Article 4(A) (1) of the Paris Convention states, "Any person who has duly filed an application for a patent of invention, or for the registration of a utility model, or for the registration of an industrial design, in one of the countries of the Union, shall enjoy, for the purpose of filing in the other countries, a right of priority during the periods hereinafter fixed…" [6]. Based on this provision, anyone who has filed an application for the registration of an invention in one of the Union countries, meaning the member states of the Paris Convention, enjoys a 12-month period in which they can seek protection in any other Union country. Subsequent applications are then treated as if they had been filed on the same date as the original application [4, 7]. Therefore, any subsequent application for the same invention in any Union country by someone other than the original applicant is considered void, and a patent cannot be granted for it, as the invention lacks the novelty required for patent protection

[8]. The right of priority excludes any application that has the status of a valid national application under the internal laws of each Union country or under bilateral or multilateral treaties concluded between Union countries.

But what is a valid national filing? Article 4(A) (3) of the same convention defines "a valid national filing as any filing that is sufficient to establish the date on which the application was filed in the country concerned, whatever may be the subsequent fate of the application" [6]. Furthermore, Article 4(B) of the Paris Convention states that any subsequent filing in any other Union country, made before the expiration of the priority period, or any acts performed during this period, particularly filing another application, publishing the invention, or exploiting it, or offering copies of the invention or model for sale, or using the mark, shall not give rise to any rights in favour of third parties or any right of personal possession. Third parties retain the rights they acquired before the date of the first application, which is the basis for the right of priority according to the internal law of each Union country [9].

From this text, it is clear that filing a patent application, the issuance of a patent, or the publication or announcement of the invention does not deprive it of the element of novelty, without which a patent cannot be granted [5, 10]. Comparative legislation has adopted the provisions of this convention, allowing any application that includes the right of priority to be filed at an earlier date in any Union country, provided that the registration is filed within a period not exceeding twelve months, starting from the day following the filing of the first application [11].

According to Article 4 of the Paris Convention, the following conditions must be met to claim the right of priority:

1. The application must be filed in one of the Union countries.
2. The filing must be properly made, and the subject matter of the previous and subsequent applications must be the same.
3. The right of priority arises if the first filing was made in a Union member state.

The purpose of priority is to provide protection for inventors' rights, which might otherwise diminish international protection for the invention. The member states of this convention are considered as one state, and the filing of a patent application in any of the member states applies to all Union countries, provided that the patent application is submitted within the priority period, which is a maximum of 12 months from the date of the original application [12].

Principle of National Treatment Among Union Nationals

This principle means that each member state of the convention grants citizens of the contracting states the same protection it provides to its own citizens. This protection, which is related to the protection of inventors and creators, must also be granted to the nationals of Union countries. Furthermore, nationals of non-member countries of this convention are also entitled to protection if they reside in a state that has joined the convention and own an industrial or commercial establishment there [13].

But what is meant by "nationals of the Union"? Any person who holds the nationality of one of the member states of the Paris Convention or resides in one of the member states and has real industrial or commercial establishments in any of the

Union countries, even if they belong to a state that is not a party to the convention [14]. Article 2 of the convention states: "Nationals of any country of the Union shall, as regards the protection of industrial property, enjoy in all the countries of the Union the advantages that their respective laws now grant, or may hereafter grant, to nationals; all without prejudice to the rights specially provided for by this Convention. Consequently, they shall have the same protection as nationals and the same legal remedy against any infringement of their rights, provided they comply with the conditions and formalities imposed upon nationals. However, no requirement as to domicile or establishment in the country where protection is claimed may be imposed upon nationals of countries of the Union for the enjoyment of any industrial property rights" [15]. The article further explicitly reserves to each country of the Union the right to make its own provisions regarding judicial and administrative procedures, as well as jurisdiction, including the appointment of an agent or a chosen domicile, which may be required by industrial property laws [12].

This article makes it clear that all nationals of Union countries enjoy the same protection that the state grants or may grant in the future to its own citizens with respect to industrial property protection. Accordingly, the Convention equalizes all Union countries in matters related to industrial property protection [5, 16]. All nationals of member states are treated as nationals within the territory of any member state of the convention [17]. Article 3 of the same convention states: "Nationals of countries outside the Union who are domiciled or have real and effective industrial or commercial establishments in the territory of one of the countries of the Union shall be treated as nationals of the countries of the Union" [13].

Based on this article, the Convention equates certain individuals who are not nationals of Union countries with citizens of the member states of the convention, provided that the person resides in a Union country and has an industrial or commercial establishment that is genuine and effective [6].

Principle of Patent Independence

This principle means that a patent granted in one of the Union states is independent of patents granted in other states. The granting of a protection document in one state does not obligate other states to grant the same protection [13]. Article 4 of the Convention states: "Patents applied for in the various countries of the Union by nationals of Union countries shall be independent of the patents obtained for the same invention in other countries, whether members of the Union or not" [6]. According to this provision, if a Jordanian national obtains a protection certificate in accordance with Jordanian patent law and then submits an application for a patent within the priority period in Chad, each of the patents will be independent of the other. In other words, the protection period for the patent under Jordanian patent law may expire before the protection period under Chadian law, meaning that each patent is independent of the other according to this principle. The application of this principle, the principle of patent independence, "leads to illogical results in practice, especially since these results do not align with the interests of developing countries. This becomes evident in cases where a judicial decision is issued declaring the patent invalid due to the lack of substantive conditions for the invention, whether in terms of the novelty of

the invention or the inability of that invention to be applied industrially outside the territory of the state. However, we find that this patent remains valid and effective, and its owner has the right to financially exploit it throughout the protection period, despite the issuance of a judgment declaring its invalidity for any reason related to the invalidity of the invention outside the territory of that state" [5, 18].

1. **Compulsory Licenses**: The Convention affirms the granting of compulsory licenses in cases where the invention is not exploited by its owner, under fair conditions that take into account the rights of the inventor [13]. Article 5(2) of the Paris Convention states: "Each country of the Union shall have the right to take legislative measures providing for the grant of compulsory licenses to prevent the abuses which might result from the exercise of the exclusive rights conferred by the patent, for example, failure to work" [19]. According to this article, each Union state has the right to grant compulsory licenses but only in two cases:

– **First**: The patent owner's abuse of their right subject to the patent.
– **Second**: The inventor's failure to exploit their invention subject to the patent.

In these two cases, the Convention permits the granting of compulsory licenses for the exploitation of the invention subject to the patent. However, a compulsory license cannot be requested based on non-exploitation or insufficient exploitation before four years have passed from the filing date of the patent application or at least three years from the date of granting the patent, with the obligation to apply the longer of these periods. However, the compulsory license will be refused if the patent owner demonstrates that they ceased exploiting their invention for legitimate reasons [6].

1. **Use of Patent Subject Means on Vessels of Other Union States**: The Convention allows the use of patented means on ships belonging to other Union states, whether in the hull of the ship, its machinery, equipment, or other additional parts, when these ships temporarily or accidentally enter the waters of the mentioned states, provided that the use of these means is limited to the needs of the ship.

This provision makes it clear that the use of a patent on means of transport is not considered an infringement of the patent owner's rights, provided that such use is on vessels of Union states and is limited to the needs of the ship only.

Or the exploitation of patented means in the manufacture or operation of aircraft or land vehicles belonging to other Union states, or their spare parts, when these vehicles temporarily or accidentally enter Union states, is not considered an infringement of the patent owner's rights [20].

1. **No Infringement on the Right of the Contracting State to Conclude Special Agreements**: Each member state of the Convention has the right to conclude its own separate agreements, independent of Union states, provided that such agreements do not conflict with the provisions of the Convention [13, 21].

2. **Temporary Protection under the Convention:** Article 11 of the Convention states: "The countries of the Union shall, in accordance with their domestic legislation, grant temporary protection to patentable inventions that are exhibited at officially recognized international exhibitions held within the territory of any of them. Such temporary protection does not result in the extension of the time periods provided for in Article 4. The authorities of each country may, in case of a subsequent claim to the right of priority, provide that the period shall commence from the date of introduction of the product into the exhibition. Each country may require such documents as it deems necessary to prove the identity of the exhibited item and the date of its introduction" [22]. Accordingly, certain conditions must be met when displaying the invention at international exhibitions [4, 21]:

- The exhibition must be official.
- The exhibition must be recognized and held within the territory of a Union member state.
- The invention must be registered before the start of the exhibition.

In conclusion, the Convention has established essential provisions and general principles that are binding on all Union member states. Membership in the 1883 The Convention is open to all countries, and accession documents must be deposited with the Director General of the World Intellectual Property Organization. It is noteworthy that the Convention began with eleven countries in 1883, and since then, the number of member states has gradually increased to 140 countries worldwide as of January 1, 1996. Consequently, the 1883 Paris Convention did not establish criminal protection for the rights of inventors and creators; rather, it set forth general provisions without imposing obligations on member states to enact criminal sanctions for the protection of industrial property.

The Convention was designed to regulate industrial property without obligating member states to impose sanctions in cases of infringement on industrial property rights. The purpose of the Convention is to regulate relations in the fields of trade and industry, promote fair commercial practices, and encourage nascent industries. This is the primary goal of the Convention, and thus, it did not impose criminal sanctions on the rights of inventors. Article 10 of the Convention states: "The countries of the Union are bound to assure to nationals of the other countries of the Union effective protection against unfair competition." The article further clarifies the acts that are considered unfair competition [23].

3 Protection of Patent Rights Under the TRIPS Agreement

The TRIPS Agreement offers patent protection for inventions across all technological fields, irrespective of the invention's country of origin or the location of production [24]. Comprising 73 articles, the agreement features both general and detailed provisions. Its overarching goals include the liberalization of international trade by effectively safeguarding intellectual property rights while ensuring that the

enforcement measures for these rights do not obstruct legitimate trade. Building upon the core principles established in the Convention and the Berne Convention for the Protection of Literary and Artistic Works, the TRIPS Agreement incorporates nearly all key provisions from these two conventions. Concluded in 1994 and taking effect on January 1, 1996, it references these earlier agreements directly. This signifies that the TRIPS Agreement does not nullify or supersede prior international agreements concerning intellectual property rights; instead, it bolsters their significance. The intention of the TRIPS Agreement was not to establish uniform substantive rules for intellectual property protection. To put it differently, the regulations set forth by this agreement signify the least amount of protection that member states are obligated to offer. Therefore, any member state can implement domestic laws that grant greater protection for inventions than what is stipulated by the TRIPS Agreement [25].

The TRIPS Agreement has led to a set of fundamental principles designed to ensure effective protection of industrial property rights. These principles include:

- The principle of national treatment.
- The principle of most-favored-nation treatment.
- The limits of protection.

The agreement outlines the conditions that must be met to obtain a patent, the rights conferred by the patent to its owner, the cases in which a patent may not be granted, and the conditions that must be met for an invention to be patented, as stipulated in Article 27 of the agreement, "Patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step, and are capable of industrial application" [26]. According to this provision, an invention must meet three basic requirements to enjoy legal protection:

- "The invention must be new.
- The invention must involve an inventive step.
- The invention must be capable of industrial application."

Regarding the situations in which patents cannot be granted, this agreement specifies that such cases include inventions whose commercial use within the territories of member states is essential for safeguarding public order, morality, public health, or the environment, as long as this exclusion is not merely due to a legal ban on such exploitation. Furthermore, countries within the agreement may also choose to exclude from patentability diagnostic, therapeutic, and surgical procedures for the treatment of humans or animals, along with plants and animals excluding microorganisms, as well as essentially biological methods for producing plants or animals, apart from non-biological and microbiological processes. Nonetheless, it is required that member states offer protection for plant varieties, either through patents or through a sui generis system specifically tailored for these varieties.

The Rights Granted to the Patent Owner According to the TRIPS Agreement

Article 28 of the TRIPS Agreement states, "A patent shall confer on its owner several rights. If the subject matter of a patent is a product, the patent owner shall have the right to prevent third parties not having the owner's consent from the acts of:

1. Making, using, offering for sale, selling, or importing that product for these purposes.
2. If the subject matter of the patent is a process, the patent owner shall have the right to prevent third parties not having the owner's consent from the act of using the process, and from the acts of using, offering for sale, selling, or importing the product obtained directly by that process for these purposes. Patent owners also have the right to assign, transfer, or license the patent to others".

Conditions for Filing a Patent Application According to the TRIPS Agreement

The applicant for a patent is required to disclose the invention in a clear and complete manner sufficient for a person skilled in the field to carry out the invention. The applicant must disclose the best method known to the inventor for carrying out the invention at the date of filing the application or at the priority date of the application when priority is claimed. Additionally, the applicant must disclose information on related applications filed in foreign countries or patents granted to them in those countries [27].

Exceptions to Patent Rights According to the TRIPS Agreement

The States Parties to this Convention may provide for limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent holder, pursuant to which the legitimate interests of third parties must be taken into account [28].

Article 31 of the TRIPS Agreement specifies the circumstances under which a patent owner's rights can be used without their consent. These are limited to specific situations outlined in this article, including when the law of any member country permits other uses of the patented subject matter without the authorization of the patent owner, including use by the government or third parties authorized by the government. Member countries must adhere to the procedures specified in Article 31 of the agreement [29].

Accordingly, what protection does this agreement provide for patent rights? And what are the fundamental principles that have resulted from this agreement?

We will answer these questions in the following three sections.

3.1 Legal Protection of Patents

After clarifying the conditions required under the TRIPS Agreement for the protection of patent rights, the cases where patents cannot be granted, the rights conferred to patent holders by this agreement, and the exceptions to patent rights, the following question arises:

What is the duration of patent protection under this agreement?

Article 33 of the TRIPS Agreement states, "The term of protection granted shall not end before the expiration of a period of twenty years counted from the filing date of the patent application" [30]. According to this provision, the duration of patent protection under this agreement is twenty years, starting from the filing date of the patent application, not from the date the patent is granted [31].

Article 34 of the agreement addresses the burden of proof in patent infringement cases involving industrial processes:

"For civil procedures regarding the infringement of the patent holder's rights referred to in paragraph 1(b) of Article 28, if the subject of the patent is a manufacturing process, the court has the authority to order the defendant to prove that the process used to manufacture a similar product differs from the process covered by the patent. Consequently, member states must provide that in at least one of the following situations, any similar product obtained by the patented manufacturing process shall be considered as a new product" [32]. According to this text, the agreement allows the court, if the patent subject is a manufacturing process, to order the defendant to prove that the process used to manufacture a similar product is different from the patented process. If the defendant proves that the process used for the similar product is different from the patented process, the defendant is not liable. For an infringement of the patent holder's rights under Article 28 of the TRIPS Agreement to occur, the following conditions must be met:

- Production must occur without the consent of the patent holder, unless proven otherwise.
- The product obtained using the patented manufacturing process must be a new product.
- There must be a significant probability that the similar product was manufactured using this process, and the patent holder has been unable to determine the actual process used despite reasonable efforts.
- Any member country has the freedom to stipulate that the burden of proof mentioned in paragraph (1) rests on the person accused of patent infringement only if the conditions mentioned in subparagraph (a) and (b) are met. Article 34(3) also considers the legitimate interests of defendants regarding the protection of their trade and industrial secrets while providing evidence to prove differences [33].

3.2 The Principle of National Treatment

Article 3 of the TRIPS Agreement provides that: "With regard to the protection of intellectual property rights, each Member State shall accord to nationals of other Member States treatment no less favorable than that accorded to its own nationals" [34]. The Convention therefore establishes equality between all nationals of the Member States and requires all Member States to provide to nationals of other Member States the same level of protection as they accord to their own citizens. This principle ensures equality between persons from different Member States and

nationals of the Member States themselves with regard to the beneficiaries of such protection, the means of obtaining such protection, its system and duration. However, the application of this principle is subject to the exceptions provided for in the agreements adopted through the TRIPS Agreement, such as the Paris Convention as revised in 1967 [35].

3.3 The Most-Favored-Nation Principle

In general, the TRIPS Agreement obliges all member countries not to discriminate between the nationals of other member states. This means that every member state must treat its own nationals and the nationals of other member states equally regarding intellectual property rights. This principle complements the previous principle of national treatment, which mandates that member states provide no less favorable treatment to nationals of other member countries compared to their own citizens regarding intellectual property protection. Without the Most-Favored-Nation Principle, the principle of national treatment would be meaningless as there would be a discrepancy in the legal protection of intellectual property due to differences in the relationships between countries and their treatment of each other [35, 36]. Article 4 of the TRIPS Agreement states, "In respect of the protection of intellectual property, any advantage, favor, privilege, or immunity granted by a member to the nationals of any other country shall be accorded immediately and unconditionally to the nationals of all other member countries, except that any advantage, favor, privilege, or immunity granted by a member shall not be extended to other members if it is provided for in a bilateral agreement" [37]. Under this provision, the TRIPS Agreement requires member states to grant immediately and unconditionally to nationals of all other member states any advantage, benefit, privilege or immunity enjoyed by nationals of one-member state. However, there are exceptions to such benefits, benefits, privileges or immunities granted by member states.

In summary, the TRIPS Agreement clarifies the rights of inventors concerning their patents, specifies cases where patents cannot be granted, and instances where the right may be exploited without the patent holder's consent. The agreement provides protection for inventions, whether they concern a final product or a process, in all technological fields, provided that the inventions are new, involve an inventive step, and are capable of industrial application. Once these conditions are met, a patent is granted [38].

A patent grants the holder the associated rights regardless of the invention's location or technological field, whether the products are imported or domestic. However, this protection is subject to exceptions, as member countries can exclude inventions that contravene public order, morality, or cause harm to life, human health, animal health, plant health, or the environment. Additionally, member countries may exclude the granting of patents for diagnostic, therapeutic, and surgical methods for treating humans or animals, or for plants [39]. The duration of patent protection is twenty

years, starting from the date of filing the patent application [40]. Notably, the agreement does not define a patent but clarifies the conditions required for an invention to be eligible for patent protection. It is worth mentioning that all member countries of this agreement have incorporated a twenty-year protection period starting from the patent application date into their national legislation.

4 Conclusion

This study highlights the significant challenges faced in patent protection in the digital technology era, where the scope of legal protection is confined to the boundaries of the granting state. Despite the efforts made through international agreements such as the Paris Convention, the PCT, and the TRIPS Agreement, there remains a pressing need to enhance and develop legal frameworks to keep pace with rapid technological advancements. Achieving effective protection requires adopting comprehensive international strategies that ensure the rights of inventors and innovators in a holistic and flexible manner, thus contributing to the global promotion and support of innovation.

4.1 Findings

The study has led to the following findings:

- Patent protection is limited to the borders of the granting country and does not automatically extend to other countries, necessitating the registration of the invention in the countries where the inventor seeks protection.
- International agreements such as the Paris Convention, the PCT, and the TRIPS Agreement provide a framework for protecting inventors' rights on a global level, ensuring the application of fundamental principles such as priority and precedence, national treatment, and the independence of patents.
- There is an overlap between the provisions in various agreements, with the TRIPS Agreement committed to reinforcing the provisions of the Paris and Berne Conventions without abolishing them.

4.2 Recommendations

This study recommends the following:

- Increasing awareness among inventors and innovators about the importance of international patent registration and how to leverage international agreements to expand the protection of their inventions.

- Simplifying and accelerating the patent registration process in different countries to reduce costs and time required for obtaining effective international protection.
- Member countries of international agreements should review and update their national legislation to ensure alignment with international principles established in agreements such as the Paris Convention, the PCT, and the TRIPS Agreement.
- Enhancing support for developing countries in the field of patent protection, providing technical assistance and training to ensure their ability to effectively protect their inventions within the international framework.

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Technological Innovations in Automated Fund Garnishment and Distribution Procedures



Ahmed Awad Al-bnian

Abstract This study explores the role of technological innovations in enhancing the automation of fund garnishment and distribution processes in debt recovery. The focus is on how modern digital solutions can optimize the allocation of funds obtained from the sale of a debtor's assets through public auctions. The research investigates how automated systems can manage the distribution of execution earnings among creditors—both secured and unsecured—based on established legal guidelines and creditor priorities. It highlights the importance of technological tools in addressing challenges such as creditor competition and the proportional allocation of limited funds when the proceeds are insufficient to fully satisfy all claims. By integrating advanced technologies, such as automated legal compliance systems and digital asset management platforms, the study proposes improvements to the traditional methods of fund distribution. These innovations are expected to increase accuracy, efficiency, and fairness in handling garnished funds, ensuring that judicial expenses are prioritized and remaining funds are allocated proportionally among creditors. The findings suggest that adopting comprehensive technological solutions could significantly enhance the management of fund garnishment procedures and support the development of more effective legal provisions for creditor claims.

Keywords Distribution · Provisions · Technology · Innovation · Execution law

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1 Introduction

The 2007 Execution Law lays out the regulation of distributing execution garnishing funds in Articles 108 to 113. What is interesting about this legal framework is that it emphasizes essential principles to consider, rather than specifying detailed creditor entitlements or rankings. The Civil Law handles such determinations, adding a fascinating layer to the Execution Law.

The allocation of auction garnishing funds among secured creditors is an undertaking of the Execution Department. This is a pivotal role within the broader legal framework involving careful orchestration. A seamless execution process is facilitated through adherence to specific stipulations enshrined in the Execution Law. This application of distribution ensures that each creditor receives a proportion that equals their outstanding debt, in a meticulous manner.

The Execution Department carries the weighty responsibility of orchestrating the allocation of garnishing funds resulting from a debtor's public auction, among secured creditors. With immaculate attention to detail and adherence to specific stipulations enshrined in the Execution Law, this intricate application of distribution ensures that each creditor receives a proportion that equates to their outstanding debt. This crucial task plays a pivotal role within the broader legal framework, facilitating a seamless execution process.

Amidst the intricate legal terrain, it is essential to tread lightly and prioritize cautious disbursement of funds, taking into account the multifaceted nature of execution processes. The priority remains to provide secure creditors with satisfactory treatment while balancing various legal frameworks and financial limitations. Safeguarding the interests of all parties is integral to upholding the system's integrity, a key objective that we keep at the forefront of our consciousness every step of the way.

1.1 Problem of the Study

When execution proceedings yield copious garnishing funds, it is evident there were no impediments during the process, leading to the thorough appeasement of secured creditors. In a positive situation like this, the orderly dispersal of execution garnishing funds follows legal protocols, granting each creditor their rightful share based on their individual debts. The challenge becomes far more intricate when execution proceedings fail to yield adequate revenue to meet the cumulative demands of all creditors. This is especially manifest in situations where various categories of creditors are involved, including ordinary creditors, privileged parties with explicit rights as per current legislation, and fellow privileged parties with equivalent hierarchical ranks. The inadequacy of the execution garnishing funds is at the heart of this challenge, as it hinders the complete liquidation of debts owed to this diverse group of creditors. A problem surfaces when funds for settlement are limited and fail to address

all the creditors' claims. This issue intensifies particularly when dealing with ordinary creditors, privileged creditors with specified legal rights, or privileged creditors sharing similar rank hierarchies. The scarcity of financial resources heightens the requirement for a considerate and fair distribution of limited funds among creditors. This calls for a detailed study of the complex legal hierarchies and entitlements, making the resolution process more complicated. The intricacies of dealing with creditors possessing unique legal privileges, along with those without, compounded by the sharing of rank, highlight the difficulty of achieving a just and agreeable resolution within the confines of a limited budget. Essentially, the execution process demands more complexity and subtle legal considerations when faced with financial constraints that prevent meeting all creditor demands.

1.2 Significance of the Study

In regard to the pursuit of legal resolutions addressing competition between creditors for debts, the topic at hand holds great importance. The significance of this matter is emphasized by both practical implications and the need for competent handling within the legal framework. The intricate dynamics involved in navigating creditor competition demands a comprehensive comprehension of legal intricacies and the development of skillful solutions to achieve fair and efficient resolutions in execution proceedings.

1.3 Methodology of the Study

The methodological approach utilized in this investigation incorporates both descriptive and analytical methods, with each method serving a unique yet complementary purpose. Descriptively, the study delves deeply into legal provisions while also examining the viewpoints expressed by legal experts. This aspect of the methodology endeavors to provide an all-encompassing and meticulous depiction of the complex legal terrain in question. Concurrently, an analytical approach is emphasized, with the goal of illuminating the frequently convoluted and multifarious passages within the Execution Law. Through a comprehensive investigation that carefully dissects and examines the language used in the statutes, this analysis aims to unravel the subtleties and nuances of the legal structure. Taking a two-fold approach, the research strives not just to present a detailed overview of the current legal provisions and academic perspectives but also to encourage a more nuanced comprehension of the intricate language found in the Execution Law.

1.4 Study Plan

Amidst a careful demarcation of the overarching topic, the thematic study is split into two discernible parts, each dealing with unique features. The inaugural fragment entails a comprehensive exploration of the bulk principles regulating the distribution of execution garnishing funds. Herein, a panoramic roadmap of the general rules governing the allocation of these garnishing funds is meticulously presented, laying a foundational framework for the rest of the discussion. Diving deeper, the second part takes a closer look at the complex dynamics surrounding the allocation of execution garnishing funds. With particular emphasis on the nuanced privileges afforded to select creditors, this examination delves into the intricate legal framework, hierarchical entitlements, and specific allocation methods that comprise the highly intricate landscape of execution distribution. The deliberate division of this topic into two sections forms a comprehensive and methodical approach that allows for an in-depth understanding of both the broad principles and highly specific details that define the distribution of execution garnishing funds, especially in regard to the rights held by privileged creditors.

2 General Rules for Distributing Garnishing Funds

An idea put forth by Al-Qudah back in 2010, centers around the principle of parity. This fundamental concept is integral in ensuring that all creditors are on level ground during the process of realizing their rights, which are derived from the assets of the debtor. The principle is adamant that, in the best-case scenario where the debt amounts to enough to pay off all creditors, entitlements ought to be distributed in an egalitarian manner. In 2012, Al-Aboudi shared a perspective that bolsters the notion of equality amongst creditors' rights. This viewpoint emphasized that such a balance can only be achieved if the cumulated debts are sizeable enough to pay off all creditors' demands. The legal framework that guides debt settlement focuses on impartiality and fairness as essential principles that accentuate the importance of even-handed distribution amongst creditors, based on the debtor's assets.

2.1 Multiple Creditors

The 2009 studies of Shushari have established a hierarchical system for debt satisfaction, which operates on a nuanced landscape. This system distinguishes between ordinary and secured debts, granting the latter priority in terms of financial claims satisfaction. After secured debt holders have settled their debts, ordinary debt holders move onto the terrain, acquiring a lower status in the debt satisfaction hierarchy compared to their privileged peers.

Al-Kilani's analysis highlights the hierarchical nature of secured debts, which requires meticulous consideration in their distribution (2022). To tackle this, Article 111 of the Execution Law outlines a structured approach for debt distribution when the garnishing funds from the sale are insufficient to cover all outstanding debts. The law mandates a sequential process, with priority given to holders of secured debt who are paid based on the ranks of their privileges. As per the legal provision, the satisfaction of these debts takes precedence over other outstanding debts. In the context of execution proceedings, the satisfaction of debts is governed by established legal principles. Accordingly, if all debts hold an equal rank of privilege and there are not enough funds to cover all of them, an equitable pro rata division takes place among the debt holders. When the available funds exceed the secured debts, the surplus gets distributed pro rata among ordinary debt holders. This article's meticulous delineation ensures a structured and unbiased allocation of funds, adhering to the aforementioned legal principles.

2.2 Payment of Execution Expenses

Guard fees, expert fees, newspaper announcements, and various other disbursements are just some of the expenses that fall under the spectrum of expenditures covered by Article 108/A of the Execution Law. This crucial provision unravels the complexities of fund disbursement in the execution process and emphasizes that the executor is bound by law to allot specific amounts from the funds collected through execution in order to recompense the creditor for incurred expenses. These expenses may include costs linked with seizure and sale, among other things.

The recognition of judicial expenses as privileged rights comes from Civil Law Article 1432. This means that disbursed amounts have the right to be reimbursed from the garnishing funds generated through the execution process. It is a smart move because it serves two purposes: first, as an incentive for creditors to keep pursuing debtor assets and collecting debts. And second, it emphasizes the importance of that privilege. The lawmaker's foresight shines through with the provision that aims to prevent creditors from abandoning the execution process due to pressure from other privileged creditors. This helps sustain momentum in the debt collection process and reduces the risk of withdrawal by creditors facing competition from their counterparts. Overall, it is a preemptive measure designed to maintain debt collection efforts.

2.3 Priority in Seizure Does not Confer Privilege

Granting priority in a seizure does not grant any privilege to the creditor, as clearly indicated in Article 113 of the Execution Law. The article entails that in the case of competing creditors, the holder of the seizure has no advantage over the others.

Additionally, if an execution document is issued based on an oral or written acknowledgment, an oath, or a later-dated written acknowledgment that comes after the legal reasons initially stated in the execution document, subsequent creditors cannot participate in any seizure.

Intervention in distribution of execution garnishing funds is allowed for other creditors when a seizure is imposed on the debtor's property. Exclusive rights to the property of the debtor are not granted to the creditor who initiated the seizure [1].

The legislator's foresight is highlighted in Article 109/D, which outlines that proceedings already taken cannot be affected by seizures made after the specified deadline in paragraph (b).. As such, any excess amounts are solely distributed among creditors who have requested seizure. The intention behind this provision is to safeguard the auction process from being manipulated by the debtor. Allowing participation from all creditors would have made room for the debtor to introduce non-existent creditors and skew the distribution of execution garnishing funds. This shrewd move by the legislator was aimed at preventing any conspiracy or deceitful actions from the debtor [2].

3 How to Distribute the Executed Garnishing Funds and Secured Rights

In the world of executions, determining who gets what is a complex process overseen by the execution department. The person in charge of the execution team is responsible for making crucial decisions regarding secured rights in line with a strict hierarchy that involves civil law, execution law, and other specialized statutes. Back in 1991, Abu Al-Wafa provided some valuable insights into how this process should work. Essentially, the head of execution meticulously follows the various legal frameworks to ensure that stakeholders are identified, and their entitlements are established. This approach is based on Abu Al-Wafa's ideas, which stress the importance of a methodical and legally sound approach to allocating privilege rights amidst the intricate web of execution proceedings.

3.1 How to Distribute the Executed Garnishing Funds?

Meticulously arranged stages are involved in the complex journey of distributing garnishing funds from an execution, each contributing to the overall coherence and efficiency of the process. The conscientious preparation of a provisional distribution list marks the beginning of this comprehensive journey, characterized by the scrupulous compilation and arrangement of all relevant details. This initial phase serves as the fundamental guide for the following stages, guaranteeing the distribution procedure unfolds with exactness and precision.

Promoting an equitable and informed participation in the subsequent stages of distribution is pivotal and requires conscientious efforts beyond the preparatory phase. This involves disseminating information to all relevant parties through a formal notification mechanism, which underscores the commitment to transparency. Adherence to procedural protocols fosters clarity and cooperation among involved stakeholders, creating an ideal environment.

The final distribution list, which marks the end of the process, emerges as the garnishing funds are allocated among the entitled parties. This ensures that the distribution of resources aligns with the established legal framework in a just and equitable manner. Al-Hajjar explained the multifaceted procedural nuances involved in this process which highlights the regulated and systematic approach that underscores the commitment to legal precision and due process in executing garnishing funds (2003).

Preparation of the Distribution List

The Execution Law's Article 109 prescribes that the head must determine if there is a need to create a temporary allocation inventory, which should comply with Article 108 of said law, and then inform the pertinent individuals. If notified, the parties have an allotted seven days for submitting a written petition to the department if they object to the provisional list. The head must then process the pleadings expeditiously. If the parties fail to object, the head shall create a definitive distribution list that discloses each creditor's allotment.

When sifting through Article 109, one can discern that the chief executive constructs a preliminary schedule for segregating execution earnings, subtracting expenses expended for the execution and legal proceedings. On top of that, debt priority is assigned, with preference given to noteworthy debtors–if they exist–in the hierarchy as detailed by legal protocols. The next course of action for the chief executive is to forward notification to the debtor, covetous debtors, and those with a covetous notification, the latter of whom will receive valid notification for exactly one week until the day after the notification is provided. Submitting a memorandum to the head of execution is the right of those who receive notices within the legal period. Once received, objections to the provisional list will be promptly considered and resolved [3]. A final distribution list indicating the share of each secured creditor will be issued by the head of execution once the objection period has expired [1].

Distribution of Executed Garnishing Funds

The debts of secured creditors are a factor in determining the distinctions according to the final distribution list. The adequacy of garnishing funds to settle debts must also be taken into account.

- The initial factor to consider is whether the collected funds are enough to satisfy the debts owed to secured creditors. Assuming this is the case, the execution department will distribute the funds accordingly to settle any debts owed and give any additional funds back to the debtor—unless there is an issue with seizure. Article 110 of the Execution Law outlines that creditors shall receive what is

rightfully due to them through execution, with the remaining balance given to the debtor.

All secured creditors' rights are settled by insufficiency of garnishing funds, with judicial expenses taking priority in the event of a shortfall. After this, proportional distribution occurs among creditors where funds are available. Where debts are mixed, priority is given to secured debts with advanced ranks, followed by secured debts based on rank. Finally, any remaining funds are distributed proportionally among regular debts [1].

3.2 Secured Rights

Among creditors, there are different ranks and degrees that determine how the collected amounts are divided. Regular creditors and creditors with granted secured rights by law fall into two categories [4].

As determined by law, privilege affords the holder the ability to satisfy their right from the debtor's funds without interference from other creditors. These privileges come in two forms: general and specific. A general privilege applies to all of the debtor's funds, with examples including the state's right to collect income tax, alimony, and labor rights. Conversely, a specific privilege applies to certain debtor assets, like those under a security mortgage. In the hierarchy of rank, a specific privilege outranks a general privilege [1]. Provisions for distributing the garnishing funds of the Execution Law are documented to pay off both privileged and regular debts. Article 111 of the Execution Law mandates that if there is not enough money to fully compensate the debts, preference is given to privileged creditors according to their level of privilege. In cases where the privileged creditors are ranked similarly and available funds cannot cover their debts, they will receive proportional distribution. If there happens to be surplus funds beyond the secured debts, regular creditors will be granted proportional compensation.

Among secured creditors, the division of the proportional implies an equitable distribution. If the garnishing funds from execution do not meet all the debts, each creditor is awarded a fraction proportionate to their debt-to-total-debt ratio [5]. This process ensures no preferential treatment and that creditors share the loss evenly. Regular and even privileged creditors use the proportional division method if they are in the same rank.

The distribution of the executed garnishing funds among secured creditors is determined by the ranking distribution, which takes into account the order, degree, and privilege of the debt. The privilege of the debt determines which creditor will be favored over others, with some debts being more privileged than others based on their priority under the law. While there can be multiple secured debts, the strength of their privilege varies depending on the extent of priority granted by the law [2].

4 Conclusion

Ensuring that creditors rightfully receive their due is the main goal when handling a debtor's assets. This involves collecting funds from a public auction of assets, which ultimately satisfies creditors' rights. However, real-life scenarios sometimes result in not enough funds to cover all outstanding debts. In these cases, a regulated and intricate process, headed by the execution leader's carefully crafted list, is used to distribute the garnishing funds. Amidst the meticulous considerations regarding hierarchical ranking and privileges as delineated by the Execution Law, a comprehensive list has been created to determine the allocation of shares among secured creditors. This approach was not important, as the head of execution has emphasized the significance of adopting a meticulous approach in ensuring an impartial distribution of garnishing funds. This approach underscores the team's devotion to upholding legal precision and procedural fairness within the execution framework.

This study has yielded several results and recommendations:

4.1 Results

1. From the debtor's funds, creditors have equal rights in fulfilling their obligations. This principle stands firm and true.
2. In the event of competing regular debts and secured debt s, priority in debt satisfaction is granted to the latter.

Placing a line does not bestow any privilege upon its holder as a priority factor.

3. General or specific, privilege allows the holder to establish their right to priority and access to the debtor's funds. This entitlement ensures advancement towards satisfying said right.
4. Among secured creditors, if the money received from the execution is not enough to pay off debts, first, the judicial expenses take the lead. After that, any remaining funds will be divided among them proportionally.
5. Leaving the prioritization of privileges to special laws and civil law, not all privileged rights were specified in the Execution Law by the legislator.

4.2 Recommendations

The way we advise Jordan's policymakers is to urge a holistic approach to improving the laws regarding executions. In particular, we propose the scrupulous recognition of all special privileges mandated by the Execution Law while detailing the order of precedence for each right. This suggestion is critical in removing any doubts or misunderstandings that could impact the judgment calls of the execution chief and those who have outstanding debts. Fortifying legal clarity and coherence is the

broader objective that aligns with the proposed legislative refinement. By consolidating the spectrum of privileged rights, execution proceedings can be transformed, and a more efficient distribution of garnishing funds can be fostered. This will bring seamless operations and enhance the efficacy and equity of the proceedings. The current scenario requires a unified approach since there are several laws that serve as a reference point for determining privileged rights' hierarchical standing. The proposed approach is in line with the need for a streamlined approach to execution proceedings.

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The Role of Gamification Technology in Enhancing Cognitive Development in Educational Settings



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Abstract The present study is on gamification technology and its role in enhancing cognitive development when implemented in educational settings. With the emergence of adaptive learning into contemporary educational environments, this paper discusses the potentials of such technologies to help bring up all rounded individuals. As much as it presents a solution to the current memorization approach used, there are also challenges that come with it especially in ensuring intrinsic motivation among learners. This research shall use a qualitative approach through descriptive and analytical reasons for reviewing related literature on the impact created by gamification towards cognitive development which is further explained in upcoming sections. Results exposed positive behavioral long-term effects while enhancing cognitive growth factors due to gamified applications. One of the recommendations at the end of this paper is giving out a proposed framework design for integrating gamification fully into course content with an emphasis laid down regarding ongoing research and refinement to maximize its use.

Keywords Gamification technology · Cognitive development · Educational settings · Adaptive learning · Virtual learning · Immersive game-based learning · Intrinsic motivation

1 Introduction

The successful establishment of various educational environments can be linked to the adoption of contemporary technology. Specifically, key elements for developing well-rounded individuals include adaptive learning, gamification techniques, and the application of virtual or immersive game-based learning. Many of these strategies

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are being promoted as enhancements to the mechanistic methods characteristic of early behaviorist teaching. As a result, certain systems are perceived as providing automatic feedback on students' responses to educational authorities, while others are tailored specifically for the individual learner. However, it is important to recognize that gamified systems may lead to unintended long-term behavioral effects, such as creating learners who are extrinsically motivated and do not appreciate the educational tool for its own sake. Clearly, challenges arise in maintaining a delicate balance. In the quest for an optimal instructional framework, this paper emphasizes the crucial role that gamification elements play in cognitive development [1].

The individual's cognitive behavior development is widely recognized as a crucial process for achieving success in academic, social, and personal realms. This chapter aims to thoroughly analyze the cognitive growth of learners alongside the components of gamification technology. Additionally, the text will be enriched with numerous examples that highlight how gamification software facilitates cognitive development. The article wraps up by proposing a framework that outlines the benefits of gamification technology within this framework [2].

1.1 Significance of the Study

The merger of modern technology with educational contexts is viewed more than ever to be central in the formation of an all-around individual. As adaptive learning, gamification techniques, and immersive game-based learning grow stronger in their applications, they offer significant improvements over the traditional mechanistic ways based on early behaviorist teaching. While these methods provide valuable opportunities for cognitive development, they also pose challenges in terms of enhancing intrinsic motivation among learners. This study has some importance in understanding the balance needed to apply gamification technology effectively. The role of gamified design in developing cognition thus adds a little more knowledge to how such technological innovations should be exploited not only to ensure academic success but also in creating a complete learner. The findings of the study seek to offer those in the education sector and policymakers an understanding of the advantages and possible disadvantages of gamified systems through a later proposed model that will promote cognitive development and deter unsought behavioral outcomes.

1.2 Methodology

This research is going to take a qualitative approach to capturing the role that gamification technology plays in enhancing cognitive development through educational contexts. The study will make use of a descriptive approach, reviewing and synthesizing already existing literature so that it provides a full understanding of the subject's current landscape and theoretical underpinning. An analytical approach

helps critically examine these findings from the literature, helping identify patterns, themes, and key insights. This combination of descriptive and analytical methods would help explore effectively how gamification impacts cognitive development, thus generating highly informed results and discussions.

1.3 Understanding Cognitive Development in Educational Settings

Cognitive development typically pertains to the exploration of how skills related to knowledge acquisition, retention, and processing progress over time. The foundational contributions of Jean Piaget in this area remain vital for comprehending the scientific understanding of these processes, having led to the creation of numerous theories and models. Concepts linked to this field portray individuals as units of information, focusing specifically on functionality—namely, how information is memorized and retrieved, as well as the efficiency of these processes [3]. The "cognitive" dimension of an individual aids in various tasks, including the mastery of known skills or languages, solving mathematical problems, and grasping the relationships and patterns present in certain professional domains [4]. Understanding one's cognitive structure provides valuable insights into the ease or difficulty of learning a concept, thereby assisting in the reconfiguration of teaching approaches, particularly within educational settings.

Cognitive models and research in instructional technology characterize human minds as systems for acquiring information, aiming to simulate mental processes through computers or to enhance instructional environments that align more closely with human cognition. In contrast, cognitive development theories emphasize the significance of social and contextual constructs, where sociocultural factors play a crucial role in academic growth. Learning is significantly influenced by various episodes that typically create ecosystems. Broadly speaking, the degree to which individuals can internalize knowledge and what they learn is determined by the processes involved in cognitive development. This branch of education integrates the teaching-learning process into people's lives, highlighting the importance of cognitive development [5].

1.4 Gamification Technology: Definition and Concepts

The concept of gamification technology is not entirely foreign to the fields of nonformal learning and entertainment. Nevertheless, its integration into educational frameworks introduces a fresh aspect to learning environments [6]. Given the interrelatedness of technological advancements, it is essential to comprehend the potential impacts this new technology may have on the evolution of education and system

development. Gamification involves applying game mechanics to non-game contexts or applications. By game-mechanizing educational systems, participant engagement is fostered, and the user experience is significantly enhanced. Within the realm of education, this approach emphasizes the participant, the process, and the content—such as a specific subject. It holds the promise of consistent, progressive improvements in cognitive abilities as a benefit of user involvement in e-learning facilitated by gamification techniques [7].

Conversely, the concepts of gamification for educational purposes remain in a testing phase, necessitating additional research to evaluate their effectiveness in authentic learning environments [8]. This study aims to elucidate the connections among the fundamental elements of gamification, theories of learning psychology, and strategies for cognitive skill development. In its broadest sense, gamification technology refers to the integration of game-like features into various systems. This can be interpreted as transforming existing systems or contexts into game-oriented formats tailored for the intended audience. Although the core idea remains consistent, it can be expressed using various terms, such as playful design, serious games, non-formal learning, and most frequently, gamification.

2 Theoretical Frameworks for Cognitive Development and Gamification

The study of cognitive development focuses on the evolution of mental processes, including understanding, knowledge, perception, reasoning, and judgment, all of which are essential to the teaching and learning process. Various theories and conceptual frameworks have emerged within the domain of cognitive development. Psychological theories have explored the core mechanisms behind cognitive processes, such as initiation, attention, rehearsal, and grouping [9]. A straightforward yet fundamental question has driven cognitive psychology and its theories of cognitive development: "What are the essential processes involved in learning and development?" In essence, this inquiry seeks to identify the moment when the overall process of cognitive development begins during the journey of growth.

When innovative teaching processes are utilized in markets that integrate knowledge from both global and local sources, these markets can facilitate the development of skills that equip students with specialized knowledge and distinct training to engage in international markets. Gamification serves as a multidisciplinary strategy, drawing heavily from education, where it functions as an active teaching technique and a social technology that aids in foreign language instruction. Research in e-learning and educational technology has explored the relationship between cognitive processes and elements of gamification; however, these investigations did not adopt a psychological or cognitive framework, and there is a scarcity of work focused on consumer psychology [9].

The chosen games, including Development, Tetris, Snake, the Alphabot, ASIMOs Play, border crossings, costs for my country, and Federal CAFE, are all excellent options. Beyond mere enjoyment and play, each game enhances mental functions through the challenges it presents and the demands it imposes. The field of cognitive psychology emerges from games designed to equip individuals for real-life situations, academic environments, and professional settings. Therefore, an individual who struggles to engage in the specific cognitive tasks expected by the end of their school years may be facing an issue related to cognitive development. This reflects a broader acknowledgment that the understanding of activity perception in a positive context has become more prevalent due to the adjustments associated with the evolution of positivism in psychology, which focuses on the integration of psychological functions.

Cognitive function pertains to how the processes and structures that influence thinking, perception, and understanding impact learning within an educational context, and the reverse is also true. My reasoning, akin to that of an engineer, scientist, or student, alongside various educational tools linked to attention, particularly theoretical insights regarding the evolution of human perception in cognitive psychology, will be elucidated from the outset [9].

The term gamification merges the ideas of gaming and games, referring to a teaching design that seeks to foster an enjoyable and motivating atmosphere, encouraging learners to engage actively in their motivation and to retain information over an extended period. This study aimed to explore cognitive psychology from a fresh angle as an instructional tool, highlighting the experience of gameful training while maintaining the principles of cognitive psychology. By selecting cognitive psychology as an independent theme, we intended to consider the semantics of the subject matter and offer a potential viewpoint [10]. Our focus on this independent theme was to provide a new perspective on the theoretical framework of gamification by generating innovative and distinct alternatives.

2.1 Empirical Evidence on the Impact of Gamification on Cognitive Development

A study conducted by Saleem et al. [11] demonstrated that students experienced greater benefits in surface-level learning from gamified formative assessment compared to traditional text feedback [11]. Conversely, the type of feedback impacted students employing surface, strategic, and deep learning approaches. Specifically, in gamified assessment scenarios, those with the lowest formal examination scores saw improvements from text feedback, while such an effect was absent in non-gamified conditions.

In a comprehensive field experiment, Moseikina et al. [12] explored the circumstances under which educational gamification positively impacts academic performance, utilizing data from a digital learning platform in China. Their findings

revealed that when courses included gamification services, students exhibited enhanced academic performance [12].

In order to define the population relevant to their research, Turan et al. [13] performed a systematic review encompassing 32 studies on online gamification. Their findings revealed that online gamification positively impacted academic performance in 81% of the instances examined [13].

In a study conducted by Tsay et al. [14], a double-blinded experiment was utilized to assess the individual effects of various gamification elements—such as dynamic leaderboards, punctuality tracks, customized avatar design, and endowment frequency—on student engagement, learning, and exam performance within a face-to-face course involving 365 students [14]. The findings revealed that students demonstrated a 42% increase in engagement when they partially implemented either dynamic leaderboards, punctuality tracks, or customized avatar design, compared to those who did not utilize these strategies. Consequently, instructors can attain comparable levels of student engagement with 64% less effort by incorporating any one of these gamification features. In particular, incentivized students exhibited a 28% higher engagement rate than their non-incentivized counterparts when they were subjected to a weekly principal along with the endowment principle, which was applied approximately each time they interacted with leaderboards and about a quarter of the time during the fix-the-picture task [15].

2.2 Design Principles for Effective Gamification in Education

The principles of learning psychology and motivation indicate that effective gamification design must engage both the cognitive and emotional systems of players while also accounting for individual variations in cognitive development. Insights gained from ten years of experience in designing and applying gamification have led to the identification of essential design principles and guidelines for creating and implementing gamified systems within learning environments [16]. In the following sections, we demonstrate how these insights can guide the design and practical application of technology-driven gamified systems in formal educational settings to promote cognitive development.

Incorporating instructional or educational games, commonly referred to as "edugames," into mainstream education ought to align with established theoretical frameworks and rely on evidence derived from sound design and empirical evaluation when selecting features for inclusion in games and gamified concepts. These insights offer several principles and guidelines for crafting effective gamification systems, as well as educational or serious games in a broader sense, which can foster cognitive development within an educational framework [17]. This encompasses the idea of integrating change through diverse gameplay experiences aimed at redirecting cognitive processes in innovative ways. Additionally, it involves providing progressively escalating challenges to maintain an appropriate balance of 'learning support' and

'learning challenge' at the intended level. Lastly, principles of training and testing can be utilized to improve retention.

3 Challenges and Limitations of Implementing Gamification in Educational Settings

Numerous challenges and constraints exist: (1) The necessity of resources when implementing gamification technology in educational settings, along with other practical concerns such as possible maladaptive effects. (2) The foundational theories have limitations, emphasizing behavioral dimensions of learning instead of the cognitive processes essential to Marx's theory of learning and the learning trails. (3) Bernstein's critique addresses these educational technologies and cognitive education, highlighting the practical and ethical dilemmas of automatically modifying the learning experience to support children's learning from an external perspective. (4) Various issues arise regarding the potential educational benefits of both social and serious games, as well as game-based learning. (5) Methodological challenges and threats to validity and reliability emerge in research related to yiGame and similar initiatives [18].

Currently, several research initiatives are proposing methods for incorporating cognition- and motivation-driven gamification into educational settings, distinguishing it from mere entertainment. In Moodle, the use of badges can cause students to become overly focused on the points they have accumulated or whether they have met certain predetermined criteria, resulting in a disconnect from their actual learning objectives. Additionally, the foundational approach of yiGame sets it apart from other recent efforts aimed at enhancing mathematical cognitive growth through gamification principles [19].

3.1 Successful Gamification Implementation

A survey carried out by RealityClaim among 1336 teachers highlighted various successful implementations of gamification in educational settings. Al-Tarawneh [5] compiled 28 strategies and best practices for gamified lessons, which were recommended by 21 expert educators on social media [14]. Additionally, it features examples of gamification, including the use of educational escape rooms within classrooms.

A prevalent digital tool utilized in gamifying escape rooms is Google Forms. In 2013, gamification specialist Michael Matera developed a six-week mission unit for his seventh-grade American history class, transforming the classroom into an escape-the-room puzzle game that provided students with an immersive learning experience [12]. This included activities such as deciphering ciphers, transmitting Morse code,

utilizing invisible ink, unlocking padlocks, and more. The gaming adventure unfolded within sector cells, endocytic gears, and cytoplasm. Even during the pandemic, Dr. Lunstrum's 7th and 8th-grade classes at Ira Harbison School engaged with the Paideia Mission game, achieving 100% student engagement and time on task [20]. On April 1, 2020, Kristy Griffin adapted the Paideia Mission game for online use amid school closures, stating, "Our game was an option for optional learning, and students were eager to try it. Overall, this was a very effective game. I had several parents email me and thank me for providing this engaging and educational option for their children while I was out of town" [11].

The 2021 School Survey from RealityClaim's Surviving the Great Shift reveals that 1336 educators rated their job equity as "excellent" or "good." Additionally, 1,338 educators expressed "strongly agree" or "agree" regarding the classroom actions and strategies necessary to turn this into a reality. Consequently, nearly 100% of our sample of gamified teachers, ranging from 2 to 21 million, is committed to this methodology [21]. Our analysis included a variety of escape-room experiences implemented within classrooms. In our review of best practices for gamification, we discovered a limited number of shorter articles and blog posts discussing personal lessons and the integration of escape room strategies. These contributions offer valuable suggestions and strategies that can assist educators and school board officials in adapting and implementing the concept within their schools as they deem appropriate [22].

3.2 Future Trends

Currently, a significant trend in the field of educational gamification involves a growing body of research examining how gamification impacts cognitive development across various knowledge areas and among a wide range of user demographics. Innovations in game components, independent games, and interactive media showcase parallel advancements, including a geometry teaching system based on gaming, a game that converts mental effort into in-game currency to aid reasoning, a mobile app designed to adjust autonomic arousal to alleviate test anxiety, and a game that detects changes in cognitive state and modifies gameplay to enhance fluid intelligence. These innovations are being transformed into practical tools and applications accessible to schools, families, and individuals facing mental health challenges. Future inquiries and advancements in gamification, game-based learning, and place-based education present further opportunities for the creation of gamification technologies. Nonetheless, it is crucial to assess how well these applications align with user needs and to enhance the breadth and quality of evidence that informs design improvements [14].

In the near future, we will witness the integration of neuroadaptive gaming along with biometric and neural metrics research into educational settings. Prototypes of computational systems that adapt to fluctuating cognitive demands during gameplay are already under development. One such system translates current theories

on promoting healthy cognition through customized gDDI game design into a real-time adaptive cognitive training framework utilizing autonomous AI. Within this framework, neural state data can guide the choice of pre-designed, custom, or spontaneously created levels of cognitive skill difficulty [13]. For instance, Neurable, a mid-sized tech startup backed by venture capital, has created a neuroadaptive virtual reality gaming experience that tailors engaging experiences directly applicable to its consumer base—neurologically-controlled VR games. The surge in popularity of these gaming technologies is reflected in the Oculus Quest, which was recognized as the publication's 'top consumer tech' product. Additionally, Epic Games, the creators of Fortnite, have ventured into the neuroscience-gaming arena by acquiring FMCG biometric companies. These advancements indicate a strong interest from both commercial and scientific sectors in neuroadaptive gamification technologies, which aim to leverage the capabilities of neurocognitive systems to enhance the learning experience [23].

4 Conclusion

This chapter presents a summary of recent studies regarding the application of gamification technology to boost cognitive development within educational environments. It details different methods for gamifying learning experiences, examines the cognitive processes that support the gamified learning approach, and offers a comprehensive review of earlier research outcomes. Finally, it suggests ways to incorporate gamification models into educational course design focused on enhancing cognitive development. Considering the potential benefits of gamification technology in enhancing learning, several factors must be addressed by educators, policy-makers, and researchers. To begin with, it is essential to investigate and refine gamified educational practices to assess their effectiveness and expand the possibilities of infrastructure for their development. Drawing from practical experiences, these insights will provide practitioners with a supportive framework for applying theoretical concepts. Furthermore, a significant amount of related research needs to be completed promptly to thoroughly validate the findings regarding experience- or biography-based training education. Additionally, further rigorous research validation is necessary to understand the effects of gamification technology on cognitive development within technology-supported educational settings. This study also includes conclusions and implications for practical application.

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Legal and Administrative Analysis of the Role of Foreign Technology Companies in Supporting Economic Development Through Digital Transformation



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Abstract With a specific focus on the role of digital transformation, this study sought to examine the operations of foreign companies and their economic influence on host countries. To achieve this, a descriptive-analytical methodology is employed, which involved reviewing the legal and regulatory frameworks governing these companies' activities and exploring the challenges and opportunities they encounter in the digital age. The study also assesses the impact of these companies on the national economy, considering factors such as job creation, workforce training, and the transfer of technical and managerial expertise, with a particular emphasis on digital innovations and technological advancements. In conclusion, the study unveils several key findings that underscore the positive effect of foreign companies, bolstered by digital transformation, in supporting the national economy and fostering an investment-friendly environment. Building on these findings, the study put forth a range of recommendations aimed at enhancing policies and procedures related to the operations of foreign companies, incorporating digital strategies to further augment their contribution to sustainable economic development.

Keywords Foreign technology companies · National economy · Economic development · Investment environment · Job creation · Transfer of expertise · Digital transformation · Technological advancements · Legal frameworks · Economic policies

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1 Introduction

Commercial enterprises have the potential to operate beyond the confines of their home country, engaging in economic endeavors across various nations by establishing representative offices and branches. The objective behind this expansion is to optimize business operations and generate profits. However, it is important to note that these branches and representative offices are perceived as foreign entities by the countries in which they operate. To ensure proper regulation of the activities of these foreign companies, nations have implemented legal frameworks to govern their operations within their borders. These regulations are rooted in the principles of upholding sovereignty, protecting national interests, and safeguarding local businesses.

Foreign companies play a vital and substantial role in promoting the economic growth of the host country. Their active participation brings valuable resources, both in terms of materials and human capital, thereby becoming a major source of revenue through tax collection. This, in turn, bolsters and fortifies the national economy. Moreover, these companies contribute to the inflow of foreign currency and the maintenance of a reserve of foreign currency within the country. By employing a significant number of local workers, they also help alleviate unemployment, while simultaneously transferring and localizing technology through their expertise in technical and managerial aspects. Additionally, these companies play a crucial role in the development of the country's infrastructure, provide alternatives to imports, and generate higher export revenues.

In order to navigate the intricate legal and economic challenges posed by foreign companies, the Jordanian legislator, like other legal systems, has dedicated a section of the Companies Law No. (22) of 1997 to address this issue. Chapter Twelve of the law specifically regulates this matter, drawing a clear distinction between two categories of companies. The first category, referred to as operating foreign companies, is comprehensively addressed in Sections (240–244), while the second category, non-operating foreign companies, is specifically covered in Chapter Two, Sections (245–251).

Operating foreign companies have been acknowledged by the Jordanian legislature as legitimate entities, enabling them to engage in business activities and carry out projects. These companies possess rights that are derived from both domestic and international laws, while also bearing responsibilities that align with the interests of the host nation. This research will initially explore the definition of operating foreign companies and distinguish them from other comparable entities in the initial segment. Subsequently, the second section will delve into the guidelines governing the registration of operating foreign companies and the frameworks established for their supervision.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the nature of the operations of foreign companies.
- Assess the economic impact of these companies.
- Examine the legal and regulatory frameworks related to the operations of foreign companies.
- Explore the challenges and opportunities faced by foreign companies.
- Provide recommendations to enhance policies and procedures supporting the business environment.

1.2 Study Methodology

To accomplish its goals, the study utilizes a descriptive-analytical methodology. The descriptive-analytical approach is commonly employed in social and human studies, with the aim of accurately depicting the phenomenon being examined and subsequently analyzing it to uncover influential factors and connections between various variables. This methodology was selected due to its appropriateness for the study's nature and objectives, as it allows for a thorough comprehension of the operations of foreign companies and the regulatory frameworks that govern them.

2 Concept of the Operating Foreign Company and Its Distinction from Similar Companies

In the usual course of affairs, it is not within the purview of lawmakers to establish definitions, as that responsibility falls to legal doctrine. However, there exists an exception to this norm, as demonstrated by the legislator's act of defining the operating foreign company in Article (240/A) of the Jordanian Companies Law No. (22) of 1997. This decision was made with the intention of removing any uncertainties or conflicts that may arise in the absence of a clear definition.

In the researcher's perspective, it would have been more favorable if the legislator had entrusted the definition of an operating foreign company to legal doctrine. This is particularly important considering that the Companies Law No. 22 of 1997 does not originally offer a precise definition for such a company.

2.1 Concept of the Operating Foreign Company

Given the absence of a specific definition of a company in the Jordanian Companies Law No. 22 of 1997, the legislator made a prudent decision to delegate this task to legal doctrine. Consequently, the researcher will commence by providing a comprehensive definition of the term "company." Following this, the researcher will proceed to elucidate the definition of an operating foreign company, as outlined in both Jordanian and Egyptian laws. The subsequent section will center around the examination of the characteristics of the activities undertaken by operating foreign companies.

2.2 Definition of the Operating Foreign Company

In Article (582) of the Jordanian Civil Code No. (43) of 1976, the lawmaker provided a definition for a company as part of the general regulations pertaining to companies. According to this definition, a company is a contractual agreement in which two or more individuals commit to contributing either financial resources or labor towards a specific project. The purpose of this contribution is to invest in the said project and distribute any resulting profits or losses among the participants [1].

The definition presented here aligns with the one given by the Egyptian lawmaker in Article (505) of the Egyptian Civil Code No. (131) of 1948. According to this definition, a company is described as a contractual agreement in which two or more individuals agree to contribute financially or through labor to a specific venture. The purpose of this collaboration is to collectively share any profits or losses that may arise from the project.

The definition provided in Article (1832) of the French Civil Code diverges from this definition, as it characterizes a company as "a contract between two or more individuals who unite their resources with the aim of distributing any resulting profits among them." However, a valid criticism of this definition is that it solely focuses on the sharing of profits and fails to acknowledge the equally important aspect of sharing losses [1].

The legislative delineation of what constitutes an operating foreign company was initially outlined in Article 2 of the Foreign Companies Registration Law No. (58) of 1985. This law defines a foreign company as any company that has not been registered in Jordan but has established a base of operations within Jordan in accordance with the aforementioned legislation.

In Article (240/A) of the Jordanian Companies Law, the Jordanian legislator offered a concise description of an operating foreign company. According to this definition, an operating foreign company is a company or entity that is registered outside of Jordan and has its headquarters situated in a different country with non-Jordanian nationality. The intention behind this definition was to establish a unified

legal term that encompasses all relevant aspects, rather than delving into the specific interpretation of each individual word. [1]

One criticism of this definition is that it merely states the company as "company," without providing any additional insight. It would have been more suitable to exclude the term "company" from the start of the definition. Furthermore, the inclusion of "entity" in the definition, despite the distinct disparity between "entity" and "company" and the absence of a clear link between them, raises doubts regarding the legislator's intent. In Jordan, there are numerous local and international entities, both official and unofficial [2].

It is important to note that the term "entity" should not be confused with "company" as they have distinct meanings and are not related to each other. The High Court of Justice made this clear in its ruling on the Jordanian Bar Association, highlighting that the association is an independent body created by law to safeguard the rights of lawyers. The association possesses legal authority over its members and advocates for their interests within the legal profession [3].

It is important to highlight that the Jordanian Civil Code No. (43) of 1976, specifically in Article (50), makes a clear distinction between entities and companies by providing separate definitions for each. Section (2) of the code mentions entities, specifically referring to "religious entities and sects," while Section (4) addresses "commercial and civil companies" as companies. This demonstrates that these terms have distinct meanings, which differs from how they are treated as a single legal term and entity under the Companies Law.

It is important to acknowledge that a commercial company is set apart from an entity based on its unique substantive and formal components [4]. These components are essential for classifying a company as such, and they are not found in an entity. This indicates that there is no valid reason for the legislator to refer to the operating foreign company as an "entity" [5].

The legislator's definition of an operating foreign company in Jordan is a broad definition that encompasses both operating and non-operating foreign companies. However, to clearly differentiate it from the non-operating foreign company, which is not allowed to conduct any commercial activities in Jordan, it would have been more suitable to include the phrase "and engages in commercial activities in Jordan" to further specify the definition [6].

Furthermore, the inclusion of the phrase "and its nationality is considered non-Jordanian" by the legislator is redundant, as the definition already clearly states that the company is registered outside of Jordan and has its headquarters in another country. This addition is therefore unnecessary [7]. In contrast, the Egyptian legislator took a different approach in addressing the activities, branches, and offices of foreign companies in Egypt through the Egyptian Companies Law No. (159) of 1981. Specifically, this is outlined in Chapter Six, Articles (165–172), which serves to safeguard public interest and regulate the operations of these companies under government supervision [8].

The definition of an operating foreign company in Egypt is outlined in Article (165). According to this definition, an operating foreign company is one that does not have its management or principal place of business in Egypt, but has a center for

conducting business within the country. This center can take the form of a branch, a manufacturing house, an administrative office, or any other similar establishment [9]. Unlike Arab and Western scholars who have provided specific definitions, Jordanian scholars have not explicitly defined an operating foreign company. However, some scholars define it as a company that has its principal place of management abroad and may either conduct all or part of its activities in Egypt through an agency, branch, or other means [10].

A different academic interpretation characterizes it as "an entity that possesses foreign citizenship," without making a distinction between an active or inactive foreign corporation. This particular definition is constrained in its reliance on the company's nationality, neglecting to specify its constituent components [10].

The Jordanian judiciary has a specific perspective on how to define foreign companies that operate within the country. They are referred to as operating foreign resident companies or companies with a branch in Jordan. According to a decision made by the Amman Court of Appeal, an operating foreign company in Jordan is defined as a company that is registered outside of Jordan and has its headquarters in another country with non-Jordanian nationality. This definition is crucial in understanding the context of the lawsuit between the appellant and the appellee, as it contradicts the interpretation made by the court of first instance [11].

According to a ruling made by the Jordanian Court of Cassation, it was declared that any foreign company that is registered in Jordan under the Companies Law possesses legal status. Therefore, the focus of the dispute lies solely on the issue of naming and not on whether the company is registered as a branch or a resident in Jordan. Another decision from the same court highlighted the scenario where an appeal is filed against a branch of a company located in Jordan, which is managed by the headquarters in Beirut. Additionally, it mentioned that the fuels handled by the branch are stored there, and the Jordanian branch incurs expenses for administration and storage.

According to the researcher, the Egyptian legislator demonstrated a higher level of precision compared to the Jordanian legislator when it comes to defining operating foreign companies. In order to be considered an operating foreign company in Egypt, the company must have a branch within the country for conducting business, setting it apart from non-operating foreign companies. Unlike the Jordanian legislator, the Egyptian legislator did not include entities within these companies, suggesting that "entity" and "company" are distinct legal terms. Additionally, the Egyptian definition does not explicitly mention the non-Egyptian nationality of these companies, as the Jordanian legislator does. This omission is based on the understanding that if a company does not have its main management or center of activity in Egypt, its non-Egyptian status is implied.

Drawing from the information provided, the researcher proposes a definition for an operating foreign company: "An operating foreign company is an entity that is established outside of Jordan, with its primary management located in another country. This company possesses legal personality and engages in commercial activities within Jordan through its branch or representative offices".

3 Nature of Activities Conducted by Operating Foreign Companies

The attainment of economic growth and prosperity in nations necessitates the presence of various fundamental elements, encompassing both economic and social aspects. Capital, technical knowledge, and scientific expertise emerge as prominent factors that play a vital role in the economic advancement of countries.

In order to promote economic growth, developing nations strive to attract foreign investments through the provision of exemptions and special privileges. One form of investment comes in the form of foreign companies, which not only contribute to the national economy of the host country but also generate employment opportunities to combat poverty and unemployment. Moreover, these companies play a vital role in training the local workforce, imparting valuable technical and managerial expertise that ultimately benefits the economies of these nations [12].

The nature of operations carried out by foreign companies operating in Jordan is defined in Article (240) of the Jordanian Companies Law No. (22) of 1997. These companies are classified into two categories based on the duration of their operations: those with a limited duration and those with permanent operations. In order to operate legally, these companies are required to obtain a work permit from the appropriate authority and comply with the registration procedures outlined in the Jordanian Companies Law. It is essential that their activities align with their stated purpose and do not contravene any laws or public order.

Foreign companies that are in operation aim to broaden their economic and business endeavors by seeking out secure investment climates and engaging in their operations. These companies may also choose to invest in developing nations where the cost of infrastructure is more affordable in comparison to other countries, and where labor expenses are lower, thus allowing for the utilization of practical and scientific knowledge.

Similar to other laws, the Jordanian legislature has implemented regulations to govern the operations of these companies, ensuring that they are not left unchecked. Instead, restrictions and guidelines have been put in place to safeguard the economy, national businesses, and the principle of state sovereignty over its territory. The legislation outlines the specific activities that these companies are permitted to engage in, as well as those that are prohibited. It is mandatory for these companies to acquire the required work permit from the appropriate authorities and adhere to the prescribed legal registration procedures.

Article (240/A) of the Jordanian Companies Law No. (22) of 1997 addresses the nature of activities conducted by operating foreign companies in Jordan, categorizing them into two types:

- The first category encompasses temporary foreign companies that are contracted to perform specific tasks within a limited timeframe. These companies are granted contracts and their registration remains valid until the completion of the assigned tasks, unless they secure new contracts during the course of their initial agreement. In such instances, their registration is extended until all their commitments are

fulfilled, at which point the company is deregistered and its assets are liquidated. Typically, these foreign companies establish contractual partnerships either with public or private entities to carry out the assigned projects under the terms of the contract. They typically establish a branch in the contracting state to facilitate the execution of the contracted work (the location specified in the contract), and the company ceases to exist once all the tasks are completed.

- There is another category of companies that are based in foreign countries but have established a permanent presence within the state by fulfilling the criteria for obtaining the essential work authorization from the competent governing bodies, which is contingent upon the nature of their operations. These companies function independently within the state and do not have any formal agreements with local entities. They have the option to operate through a branch that represents and acts on behalf of the company.

The researcher will address the nature of the activities of operating foreign companies as follows.

3.1 Foreign Companies Operating for a Limited Duration

Article (240/A) of the Jordanian Companies Law No. (22) of 1997 specifically addresses the presence of foreign companies of this nature. The legislation outlines two distinct categories based on their activities. The first category encompasses companies that operate for a limited duration, typically those awarded tenders to undertake specific projects within Jordan. Registration for these companies expires upon the completion of their assigned tasks, unless they secure new contracts, in which case their registration is extended to accommodate the new projects. Once all their work in Jordan is finished and their rights and obligations have been settled, their registration is officially revoked.

It is evident from the preceding passage that this particular company is granted contracts within Jordan and carries them out within a designated timeframe. Once these projects are finished, their registration comes to an end unless they secure new contracts. In such instances, their registration is extended until they fulfill their new responsibilities, at which point they are deregistered and their rights and obligations are settled. In essence, these companies have a defined objective for which they were registered, and once that objective is accomplished, the company must cease to exist [13].

For a foreign company to be classified as operating temporarily, it must fulfill two requirements. The first is the successful acquisition of tenders, and the second is the timely completion of said tenders [14].

It is important to acknowledge that the legislator has placed restrictions on the operations of these companies, limiting them to participating in tenders only. However, these companies are still able to engage in contractual relationships with other entities and enter into new work agreements for projects and activities that

extend beyond tenders. The legislator explicitly addressed this limitation in the same text by stating, "unless they secure new contracts," which indicates that the legislator did not confine their activities solely to tenders. If that were the case, the text would have clearly stated, "unless they obtain new tenders." Government departments and ministries have the authority to issue tenders for specific projects or directly select a contractor, whether it be for the purchase or sale of supplies, the execution of public works, or the provision of services. This is outlined in Article (20) of the Government Works Regulation No. (17) of 1986, which states, "Works or technical services may be executed through negotiation and assignment according to the authorities specified in Article (21) of this regulation" [15].

The legislation in question does not impose any restrictions on foreign companies operating in Jordan, limiting their activities to tender processes alone. On the contrary, it provides them with the freedom to engage in contractual agreements across various sectors. This was confirmed by the Jordanian Court of Cassation in its ruling, which stated, "The first defendant, a foreign company operating as a branch and registered under number (954) with the Registrar of Companies, intends to carry out the Atarat Direct Burn Oil Shale Power Plant project in the Atarat area of the Giza District. The project involves the design, supply, and installation of a power generation plant that utilizes direct oil shale burning" [16].

It has been affirmed through another ruling that the foreign corporation conducting operations within Jordan possesses the ability to engage in contractual agreements with entities across diverse industries. The ruling states, "The accused party is an American foreign company that is actively operating within Jordan. It is officially registered with the Ministry of Industry and Trade—Companies Control Department, and holds the registration number (774). The company's objectives encompass the successful execution of multiple development initiatives within the healthcare sector, specifically for the Ministry of Health. These projects are funded by USAID and include the collaborative efforts of the Ministry of Health, such as the Local Health Systems Sustainability Project and the Integrated Health Care Project" [17].

In a similar vein, another ruling highlighted, "The initial defendant is an organization officially registered with the Registrar of Companies in the Register of Foreign Companies that operates within Jordan. It holds the national establishment number (200154403) and specializes in the planning and implementation of the second and third stages of the Aqaba Port" [18]. It is clear that the judgments made by the Jordanian Court of Cassation are in accordance with the legislative permission granted to foreign companies operating within Jordan for a specific period of time to engage in contractual agreements across a wide range of industries, not solely limited to tenders.

The researcher believes that the legislator was not precise in defining the foreign company operating for a limited duration as outlined in Article (240/A) of the Jordanian Companies Law No. 22 of 1997 for the following reasons [19]:

1. **Error in the Legal Expression**: There was an error made by the legislator when describing the activities of the foreign company operating under Article (240/A) of the Jordanian Companies Law No. 22 of 1997. The error occurred when the

legislator mixed up two different types of companies: One based on the nature of their work and the other based on their duration of operation. The legislator used different expressions to convey the same meaning, which is the nature of the company's work. However, upon closer examination, it becomes clear that there is a significant difference between these expressions. The expression used actually refers to the duration of the activities rather than the nature of the company's work. Therefore, it would have been more appropriate to replace the term "nature of its work" in the text with the phrase "divided based on its duration into companies operating for a limited period and companies operating permanently."

2. **Terminology Precision**: To enhance accuracy, it would have been preferable for the legislator to employ the phrase "companies with a limited duration of operation" rather than "companies operating for a limited duration." The terminology utilized in the former text implies that the company itself possesses a restricted lifespan.
3. **Correction of Error**: The lawmaker acknowledged a mistake within the initial provisions of Article (240/A) in the Jordanian Companies Law No. 22 of 1997. This mistake pertained to the limitations imposed on foreign companies operating temporarily in the country, restricting their activities solely to participating in tenders. However, the lawmaker rectified this error within the same article by granting these foreign companies the freedom to undertake projects beyond tenders. This was explicitly stated as "unless it obtains new contracts," thereby enabling them to enter into contracts and carry out projects with both state institutions and the private sector.

The proposed recommendation from the researcher is to modify Article (240/A) of the Jordanian Companies Law No. 22 of 1997. The suggested amendment would entail a rephrasing of the article to state, "… classified according to their operational timeframe into two categories: 1- Companies with a finite duration of operation, which encompass entities engaged in contractual agreements for a specific period, concluding their registration upon the fulfillment of said activities unless they secure additional contracts…".

3.2 Foreign Companies Operating in Jordan on a Permanent Basis

According to Article (240/A) of the Jordanian Companies Law No. 22 of 1997, the legislator has established a specific category of company. This category is divided into two types based on the nature of their operations. The second type consists of companies that operate within Jordan on a permanent basis and hold a license from the appropriate competent authorities [20].

When considering the presence of a foreign company operating within Jordan for a specific duration, there are two prerequisites that must be met. Firstly, the company

must successfully secure tenders, and secondly, it must operate within a defined timeframe. On the other hand, a foreign company that operates permanently engages in enduring contractual arrangements with individuals and entities, either through long-term agreements or by continuously conducting business within Jordan without formal contractual obligations [19].

The state has two options when it comes to partnering with a foreign company that operates within Jordan on a long-term basis. They can either initiate a tender process where multiple foreign companies compete for the contract, or they can opt for direct selection. An example of this is the Disi Water Conveyance Project, where the government chose to partner with the Gamma Turkish Company. The state relies on these companies for their expertise, competence, equipment, and financial resources, which may not be readily available within the country. It is worth noting that once these projects are completed, the involvement of these companies typically comes to an end, as seen with the Abdoun Bridge Project.

There are two types of contracts that should be emphasized when discussing tenders awarded to foreign companies with an indefinite duration of operation. The first type involves the establishment of a permanent contractual relationship between the foreign company and either the state and its institutions or the private sector, with both parties benefiting from the arrangement. In cases where the state lacks the necessary financing, expertise, equipment, and competencies to undertake major projects, it seeks assistance from foreign companies that possess these resources. These contracts, known as "concession contracts" [21], are commonly associated with the extraction of oil and minerals in developing countries that have natural resources but lack the means to exploit them. Through these contracts, specialized foreign companies are contracted to handle the extraction, production, and distribution processes, ensuring mutual benefit for all parties involved. In addition to concession contracts, public and private works contracts are also utilized to carry out major projects that the state and its institutions are unable to undertake on their own.

In the second scenario, foreign companies choose to establish a permanent presence in Jordan without engaging in contractual arrangements with other entities. These companies view Jordan as an attractive investment destination, thanks to its cost-effective labor, well-developed infrastructure, affordable raw materials, and the lack of local competitors that can match their resources and skills in large-scale projects. This drives them to establish a permanent branch within Jordan, allowing them to carry out their operations without the need for contractual agreements with external parties [22].

It is important to acknowledge that foreign companies that wish to operate in Jordan must obtain a work authorization and register it by the Companies Regulatory Official operating in Jordan. It is crucial for these companies to conduct their activities on a permanent basis, rather than temporarily, in order to avoid mandatory liquidation as outlined in Article (266/A) of the Jordanian Companies Law. This article states that a request for compulsory liquidation can be made to the court by a civil attorney general, auditor, or their representative. The court has the authority to decide on liquidation in certain circumstances, including if the company has ceased its operations for a year without a valid or legitimate reason [22].

According to the researcher, the factor that sets apart a foreign company operating temporarily from one operating indefinitely is the element of time. When a company's operations have a predetermined end date, it falls under the category of operating for a limited period. On the other hand, if there is no specified end date, it is classified as a foreign company operating permanently [23].

In Egypt, there is no distinction made by the law between temporary and permanent foreign companies. Instead, foreign companies are required to refrain from engaging in any activities within Egypt until they establish a branch in accordance with the Commercial Register Law and inform the Companies Authority by providing the necessary branch registration documents. Failure to adhere to the registration procedures outlined by law can result in the administrative closure of a company's branch, as stated in Article (309) of the Executive Regulations of the Egyptian Companies Law [24]. This article states that no foreign company is permitted to carry out any activities in Egypt until it establishes a branch in accordance with the Commercial Register Law. The company must then notify the General Companies Administration by submitting a copy of the registration documents to be recorded in a special register specifically created for this purpose. If a foreign company's branch in Egypt fails to follow the procedures outlined in the aforementioned paragraph, it may face administrative closure [25].

By acknowledging the legal identity of foreign corporations, the Jordanian legislature bestows upon them the privilege to partake in any trade-related endeavors within Jordan. This is based on the fundamental principle of freedom in engaging in commercial activities and ensuring equal treatment with domestic enterprises. However, it is crucial for these foreign companies to complete the requisite registration procedures and acquire the necessary permits. Once these formalities are fulfilled, the company is endowed with legal capacity, enabling it to carry out all lawful transactions within Jordan, as long as they align with the company's intended objectives and adhere to the laws and public order of the country [26].

4 Conclusion

The significance of foreign companies in bolstering the economy of Jordan and facilitating its economic progress is underscored by this study. Through the provision of technical and scientific knowledge and the generation of employment opportunities, these companies actively contribute to economic expansion and the mitigation of unemployment rates. Nevertheless, it is imperative to establish a regulatory framework that strikes a harmonious balance between the interests of foreign companies and the national interests, safeguarding the national economy and fortifying its long-term viability. The findings of this study underscore the necessity of revisiting and revising economic policies and legislation pertaining to foreign companies to ensure optimal benefits for both the host nation and investors.

4.1 Results

The study concludes the following results:

- The contribution of foreign companies operating within the country to the national economy is significant, as they bring in capital, technical knowledge, and scientific expertise.
- The involvement of international corporations in generating employment opportunities plays a crucial role in combating high rates of unemployment and poverty.
- By offering training programs to the local workforce, these companies contribute to the development of technical and managerial skills within the country.
- In Jordan, foreign companies are required to adhere to stringent laws and regulations that govern their operations and ensure that they are aligned with their intended purpose.
- There are two primary categories of foreign companies: those that operate temporarily and those that operate permanently, each having its own distinct registration requirements and procedures.
- Permanently operating foreign companies play a crucial role in contributing to significant projects and possess the capacity to establish enduring contractual partnerships with both government entities and the private sector.

4.2 Recommendations

Based on the results, the study recommends the following:

- Provide greater incentives and guarantees to attract foreign companies to invest in the country, focusing on providing adequate infrastructure and simplifying legal and administrative procedures.
- Update and develop laws and regulations for foreign companies to provide greater transparency and flexibility in line with global economic developments.
- Strengthen cooperation between foreign companies and local companies by encouraging strategic partnerships and the transfer of technology and knowledge.
- Increase training programs for the local workforce in partnership with foreign companies to ensure they acquire the necessary skills and expertise.
- Strengthen monitoring of foreign companies' compliance with local laws and regulations to ensure they do not violate the law and protect the domestic economy.

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The Difference Between Motion Verbs Behavior in English and Arabic



Wafa Abu Hatab, Wala'a Abuzir, and Mohammed Al-Badawi

Abstract This research paper investigates the differences in the behavior of motion verbs in English and Arabic, employing dictionaries and the novel "Eighty Days Around the World" as data sources. The study adopts Talmy's theoretical framework, providing a comprehensive understanding of how these two languages encode and express motion events. The analysis reveals distinct lexicalization patterns, with English emphasizing specific motion verbs and manner of motion, while Arabic relies more on general verbs and the path or direction of movement. Dictionaries are therefore a valuable resource that can enable the identification and categorization of motion verbs in both languages. The textual analysis of "Eighty Days Around the World" further contributes contextual examples on how motion events are expressed in English and Arabic narratives. The results help to reveal syntactic features of motion verbs, reflecting the typological distinctions between the two languages. It is this light that the research will add value to cross-linguistic studies and open more doors for exploration into the complexities of English and Arabic motion verb behavior.

Keywords Syntax · Talmy's theoretical framework · Verb · Syntactic · Structure

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1 Introduction

Language is the most important tool for human communication through which the reflections of cultural subtleties and cognitive activities are expressed. A major language from Semitic and another from Indo-European, with their distinct linguistic and cultural backgrounds (such as Arabic and English), offer an excellent opportunity to study the variations and subtleties of language expression. This research paper seeks to shed light on the differences between Arabic and English, considering their various linguistic structures and cultural settings.

English, which is a member of the Indo-European family of languages, is considered the major global language of communication. It has a predominantly analytic structure—meaning it depends on word order, auxiliary verbs, and prepositions to convey meaning. In turn, the Arabic language (belonging to the Semitic language family) has greater morphology and is more synthetic—it has complex verb conjugations, noun declensions and sentences.

Language is intriguing because it deals with several aspects of human life—including how we describe and think about events that happen around us, and how objects and entities move in space. Motion verbs are used to capture these dynamic events. Movement verbs are linguistic tools that people use to express and conceptualize various parameters of movement, including manner, path, and direction.

Their findings indicate that the study of motion verbs not only sheds light on the operation of language, but also on the interdependence of language, cognition, and knowledge of spatial relationality. Comparing how motor events are encoded and expressed using verbs in different languages can reveal how speakers of these languages perceive and conceptualize dynamic situations [8].

Like other areas of linguistics, verbs of motion are a popular playground for researchers seeking to elucidate the semantic and syntactic properties of verbs of motion. As the mosaic of motion verb behavior gradually emerged from the study of languages with extremely diverse patterns and structures, insights and hypotheses began to accumulate, and theoretical frameworks began to take shape, such as Leonard Talmy's seminal work on linguistic coding and event conceptualization motor skills [7].

Some movement verbs are simple, e.g. walk, run, walk. Others are more complex, such as flying, swimming, walking. The types of semantic information encoded in motion verbs allow for more detailed cross-linguistic distinctions of speed, force, and manner. In English, for example, verbs such as walk, run, or crawl signal specific manners of motion. Prepositions or adverbs are used to signal path or direction of motion. For example: walk across the street, run towards the lake.

The diversity of surface motion verb behavior is also contributed by the syntactic structures used to express motion events. Different languages have different strategies in integrating motion verbs into sentences—varying word orders, use of case marking, or presence of auxiliary verbs—and these choices impact speakers' and listeners' understandings and interpretations of motion events as well [12].

Understanding the functioning of motion verbs is not only interesting for linguists but also holds some implications that are practical in other fields, as well. For example, correct translation of motion events from one language to another requires an in-depth understanding of the semantic and syntactic properties of motion verbs in both the concerned languages. Knowledge on how learners acquire and process motion verb structures could be of use in devising language teaching methodologies. When people talk about motion in their language, effective cross-cultural communication relies on understanding the languages of others [2].

In sum, motion verbs are tools of language that allow us to express and perceive the dynamicity of motion events. The investigation into how they behave provides a rather interesting way to delve into that complex relationship between language, cognition, and spatial representation. Gaining some useful information on how syntactic behavior concerning such verbs of motion in different languages could mirror and mold our cognition of motion would be great. Such a study also has its practical implications for improving practice of translation as well as methodologies for teaching a foreign language based on intercultural analysis in cognitive aspects of linguistic phenomena, thus ensuring more precise and culturally sensitive communication between individuals representing different linguo-cultural spheres [2].

1.1 Objective of the Study

By addressing these research questions, this study aims to contribute to our understanding of the linguistic and cognitive aspects of motion verb behavior in English and Arabic. By identifying and analyzing the differences in lexicalization patterns and syntactic structures, we can gain insights into the distinct ways in which motion events are conceptualized and expressed in these languages.

1.2 Statement of the Problem

The representation of motion events in language is a topic that has attracted much linguistic and cognitive interest. How different languages encode and express these events is an important source of information about the interplay between language, culture, and cognition. An investigation into the behavior of motion verbs in English and Arabic would help reveal some of the particular challenges and variations that may be involved in expressing motion events in these two languages.

Although the lexical and syntactic differences between English and other languages have been the subject of much research, there is little in the way of a discussion, within the literature, on English and Arabic—research study specific behavior of motion verbs in both these languages. This research paper aims to address this gap by examining the following research questions:

1. How do motion verbs in English and Arabic differ in terms of lexicalization patterns?
2. What are the syntactic structures employed in English and Arabic to represent motion events?

In addressing these research questions, therefore, the current study aims to make a novel contribution to our understanding of the linguistic and cognitive factors involved in the behavior of motion verbs in English and Arabic. In doing so, in terms of differences in lexicalization patterns and syntactic structures, we can gain some insights into the different manners through which motion events are conceptualized and expressed in these languages.

2 Literature Review

"Toward a Cognitive Semantics: Concept Structuring Systems, Vol. II" is a book written by Talmy in which a comprehensive framework for cognitive semantics and concept structuring systems is offered. Talmy investigates how different languages express the structuring and conceptualization of events, particularly motion events, in great detail. It is a book that will interest many researchers involved in the areas of cognitive linguistics and event representation.

In his study "The Many Ways to Search for a Frog: Linguistic Typology and the Expression of Motion Events," [20] provides a broad and detailed analysis of how motion events are encoded and conceptualized in different languages. The languages, both verb- and satellite-framed, were considered in the paper sample to reveal any possible cross-linguistic variations in expressing path and manner information.

One important strength of this study is its coverage across many languages, which will provide a good overall picture of how motion verbs behave. The use of both qualitative and quantitative analysis as research methodology would certainly enhance the credibility of the findings. More importantly, it helps to bring out clearly the close relationship between language and cognition by narrowing down from general linguistic analysis to specific cognitive processes involved.

Though it is a great study, one possible limitation could be that the sample size of languages is quite small, therefore not fully representing global linguistic diversity. Moreover, the study should have gone deep into how much cultural and contextual factors influence motion verb behavior. To sum up, [20] work is referred to as an important landmark in the description of diversity in motion verb behavior. The study provides informative evidence in the field of linguistic typology about the complicated relationship of language, culture, and cognition.

In her 2015 study, "Motion Events in Arabic and English: A Comparative Study," Al-Obaidi presents interesting findings on how motion events are expressed in Arabic compared to English. An analysis of the semantic and syntactic properties of motion verbs in both languages is presented. The paper gives a full-fledged, detailed

exploration of cognitive and linguistic factors conditioning expressions of motion events.

In his paper, "The Lexicalization of Motion Verbs in Arabic and English: A Comparative Study," [10] centers on the lexicalization patterns of motion verbs in Arabic and English. It presents findings from a contrastive analysis that investigated the specific lexical items and their associated meanings concerning motion events in each language. The results contribute evidence on the lexical options particular to each language and the fine semantic distinctions they can make in expressing motion events.

In his study, "Motion Events in Arabic: A Comparative Analysis of Two Dialects," Alqurashi presents a comparative analysis of motion event expressions in two Arabic dialects. It investigates how far the variation in semantic and syntactic features is possible within Arabic dialects by putting specific emphasis on the dialectal differences in the behavior of motion verbs. The study enhances the understanding of the intra-regional variations within Arabic.

In his paper "A Corpus-Based Analysis of Motion Verbs in English and Arabic," [18] takes a corpus-based approach to the use of motion verbs in English and Arabic. It identifies and compares, based on a large dataset, the collocations, syntactic patterns, and semantic features underlining such verbs of motion in both languages. This is very informative on how patterns of use of verbs of motion can be so variable.

They do contribute, however, to our understanding of how motion verbs behave in Arabic and English. The methodology used in these studies varies from comparative analysis to corpus-based analysis and dialectal analysis, but they all aim to uncover the subtleties and intricacies of motion event expression. These studies thus represent an important resource for further research in the areas of comparative linguistics and cross-cultural communication.

In his paper, "The Categorization of Motion Events in Arabic and English: A Contrastive Study," [6] delves deep into an extensive analysis of how different Arabic is from English in the categorization of motion events. The contrastive study explores the specific ways in which the two languages, Arabic and English, categorize and conceptualize such events.

To identify and compare the semantic and syntactic features associated with motion event categorization, the study bases its findings on a fine-grained analysis of data from both languages. Al-Rubaii's analysis contributes significantly to identifying those cognitive and cultural factors that influence the categorization of motion events in Arabic and English. Its major strength lies in the detailed contrastive analysis that makes a systematic comparison of the strategies each language uses in their categorization possible. Another strength of this study is that by focusing on both semantic and syntactic aspects, it provides an in-depth understanding of differences and similarities in motion event categorization.

However, the study would benefit from having a larger sample and discussing explicitly the influences of culture and context on motion event categorization in Arabic and in English. It should also have gone deeper into the exploration of the cognitive mechanisms that underlie these categorization processes, thus giving more theoretical weight to the study.

Overall, this study by Al-Rubaii [6] helps in understanding the categorization of motion events in Arabic and English, bringing into focus the linguistic and cognitive factors that mold these typology systems. Its contrastive methodology and minute analysis of the two languages give valuable inspiration for future work in comparative linguistics and cognitive semantics.

In their paper, "Motion Events in Arabic: A Corpus-Based Study of English-Arabic Translation," [4] discuss motion events in Arabic from a corpus-based analysis of English-Arabic translations. The primary objective of this paper is to investigate the challenges and employed strategies in translating motion events from English into Arabic.

The researchers take up a corpus-based methodology, where a large dataset of translated texts is analyzed to detect patterns and variations in the translation of motion events. In their paper, they analyze and discuss the semantic and syntactic choices that translators opt for when rendering motion events in Arabic. This is, indeed, one of the strengths found in this study, where it could carry out an analysis based on a large corpus of translated texts to give an account of the patterns and strategies in translation. More importantly, it ensures reliability and validity by basing its findings on a large dataset of translated texts, thus providing a strong basis for the analysis.

The study, however, could be more explicit about the translation process and what challenges, specifically in translating motion events, were encountered. Additionally, it would greatly improve the insights of this study if the impact of cultural and linguistic factors on translation choices were to be more deeply explored.

Overall, the study by Al-Kubaisy and Al-Rufaie [4] adds to our knowledge of motion events in Arabic translation. The corpus-based analysis is informative about the difficulties and ways of solving them that translators have to experience, thus showing how challenging it may be to translate motion events from English into Arabic.

In his paper "A Comparative Study of Motion Verbs in English and Arabic: A Cognitive Approach," [14] presents important findings on the similarities and differences in the behavior of motion verbs between English and Arabic. The study takes a cognitive approach to exploring how these two languages, English and Arabic, conceptualize and express events of motion.

The study uses a comparative methodology in analyzing motion verb behavior based on principles derived from cognitive linguistics. By looking at the different semantic and syntactic patterns of motion verbs between English and Arabic, this paper sheds light on the different cognitive structures that underlie their use. A significant strong point of this study is the perspective it takes from a cognitive point of view, thus enriching this analysis by exploring how language and cognition are related in the domain of motion verbs. This approach also enables a more holistic understanding of the underlying conceptualization processes in both languages.

However, it could be helpful for the study to have a larger sample size and to further investigate contextual and cultural factors that might influence how motion verb behaviors are. It may also be valuable to discuss more explicitly the limitations and generalizability of the findings for the impact of this study.

Alqahtani's [14] study overall contributes to our understanding of motion verb behavior in English and Arabic, from a cognitive perspective, how similar and different these languages are. Therefore, this study can be taken as a good reference for future researchers in the field of comparative linguistics and cognitive semantics.

Al-Bokhary's [3] "A Corpus-Based Analysis of Motion Verbs in English and Arabic: A Contrastive Study" contributes to a better understanding of the behavior of motion verbs in both languages through contrastive analysis, focusing on English and Arabic. The study applies a corpus-based methodology to investigate patterns of use and semantic distinctions concerning motion verbs in both languages.

In this paper, Al-Bokhary uses corpus linguistics methods to explore a large dataset and identify the specific contexts and collocations in which motion verbs are used in English and Arabic. The study can shed light on what syntactic and semantic features characterize the behavior of these verbs in each language.

One strength of the study is its use of corpus linguistics, which allows for a com-prehensive and data-driven examination of motion verb behavior. The study's reliance on a large and diverse corpus enhances the reliability and generalizability of the findings. However, the study could benefit from a more explicit theoretical frame-work and a deeper exploration of the underlying cognitive and cultural factors that may influence the usage of motion verbs in English and Arabic. Additionally, a discussion of the limitations and potential biases of the chosen corpora would strengthen the study's validity. One strength this paper has is in the use of corpus linguistics that allows investigating motion verb behavior comprehensively and based on data. More specifically, this study could have been further improved by more clearly explicating its theoretical framework and delving more deeply into what these observed tendencies might suggest about either underlying cognitive or cultural factors driving variation in how speakers of English or Arabic deploy such motion verbs. This paper would also have been strengthened by a discussion regarding limitations and potential biases in its choice of corpora.

Al-Bokhary's [3] study is, on the whole, a very useful contribution to the contrastive analysis of motion verbs in English and Arabic. The author's corpus-based approach helps us see how far we can go with a description of use and meaning distinctions for these verbs and allows us to have a base to start further research in comparative linguistics based on this foundation.

The four research papers differ in their specific focus, approaches, and methodologies. Alqahtani [14] adopts a cognitive approach to examine the differences in motion verb behavior between English and Arabic. In contrast, Al-Bokhary [3] takes a corpus-based approach, analyzing a large dataset to compare motion verb usage in both languages. Al-Rubaii [6] focuses on the categorization of motion events in Arabic and English through a contrastive analysis, while [4] explore motion events in Arabic specifically in the context of English-Arabic translation. Each study provides unique insights into the complexities of motion verb behavior, employing distinct methodologies to uncover the similarities and differences between English and Arabic.

Bohnemeyer and Pederson [17] make a contribution to the understanding of event representation and language specificity in their chapter "Event Representation and

Language Specificity." They investigate how language and general cognition might be influenced by language-specific structures for conceptualization and expression of events. The paper provides some insight into the intricate relationship between language and cognition in the domain of event representation.

Al-Badawi [1] worked on the grammaticalization of the motion verb "Rah" in Syrian Arabic. Jarad studied this verb in Classical/slandered Arabic in Syrian and other Arabic dialects. In addition to compare the using of it with the verb "go" which they are equal in meaning. He studied the motion verb under its grammaticalization use. He studied the motion verb in the changes of using such as under semantic, syntactic and phonological.

Alqurashi [15] investigates motion verb behavior in English and Arabic in their article, "Motion Verbs in English and Arabic: A Comparative Study." The study employs a comparative analysis to examine the similarities and differences in motion verb usage between the two languages. The research provides insights into the syntactic and semantic aspects of motion verb behavior and contributes to the field of comparative linguistics.

Ghoneim [19] explores the semantics of motion verbs in English and Arabic in their study, "The Semantics of Motion Verbs in English and Arabic: A Comparative Study." Through an analysis of lexical and conceptual structures, the research highlights the semantic distinctions and commonalities in motion verb usage. The study enriches our understanding of the semantic systems of English and Arabic and their implications for cross-linguistic communication.

In their paper "A Comparative Study of Motion Verb Behavior in English and Arabic: A Cognitive Linguistics Perspective)," Al-Wahshi discusses issues related to the behavior of motion verbs in English and Arabic from the cognitive linguistics point of view. The research explores the cognitive structures and conceptualization of motion events in these two languages, thereby revealing the commonalities and variations in their motion verb behavior. It also contributes to understanding the nature of the cognitive processes underlying the expression of motion events.

In their paper "Motion Events in Arabic: A Typological Perspective," [13] take a closer look at the typological features and patterns of expressing motion events in Arabic, thus adding a lot of specifics about what the language-specific features are. This is what makes a great contribution to typology as a field and enriches our understanding of how motion event encoding can be done in Arabic.

Overall, these studies make valuable contributions to our understanding of how motion events are expressed in different languages, coming from various perspectives (linguistic typology, cognitive linguistics, semantics, typology) and thus providing richer insights into the complexities and variations of the behavior of motion verbs, which inform language-specific structuring and cognitive processes involved in event representation.

The previous studies worked on motion verbs in English and Arabic languages, in [5] studied the Persian and English motion verbs. The researcher used Fillmore theory of the semantics frame and Talmy theory in manner frame. This study aimed to see if there is similarities and differences between both languages or not. 30 verbs were collected and compared in both languages under the manner and semantic frames.

The study found that Persian and English motion verbs are completely different in use. Alqurashi [16] and Al-Rubaii [6] in their research worked on the motion verbs in Jordanian Arabic semantic structure by using the theoretical framework of Talmy. They made a contrastive study by looking at the morion verbs in the lexicalization pattern in Arabic and the counterpart of each word in English. Riziq and Hamdan collected 50 samples of motion verbs by native speakers and each verb used in a sentence. After collecting Arabic data they compare it with English to reveal that both languages use the motion verbs frequently and there is no difference of using these verbs between both languages. In addition, their study did not support Talmy's theoretical framework.

Al-Wahshi [11] studied motion verbs in Arabic to their counterpart in English by collecting data from encyclopedia, English dictionaries and Al-Mu'jam Al-Waseet, etc.… the data were analyzed in two ways, first by looking at semantic component and second on the direction of motion. They put each motion verbs in different sentence to help them to analyse and compare both languages with each other. The researchers in their analysis focused on Talmy's components for motion. The result in this study share the same result in [5, 14] that the two languages show no difference in the way of expressing motion verbs.

Al-Tarawneh [9] worked on short stories to make a contrastive study between English and Arabic motion verbs to show the differences and similarity between both languages. The researchers worked on a hypothesis that there is no similarity and no differences between motion verbs in the two languages, which this research will work on it to see if it is validated or not. The researchers classified motion verbs by analyzing the data and by using qualitative descriptive method. This study reveals that the two languages motion verbs appear or express in the same way but the one difference is that in Arabic motion verbs have many names for the same verb while in English there is not. So, according to this findings the hypothesis rejected.

As we see the previous studies all share the same findings that there is a similarity between motion verbs in English and Arabic, while that last studies showed one difference between them.

3 Theoretical Framework

In this study, the researcher will use Talmy's theory known as the "Talmy's Typology," is a framework proposed by Leonard Talmy, a cognitive linguist, to categorize and describe the relationship between language, perception, and thought. While Talmy's theory primarily focuses on the relationship between syntax and semantics, it does touch upon some aspects of syntactic structure as well.

Talmy focuses on the typology and conceptualization of motion events by examining how different languages encode motion through lexical and syntactic means. Syntax is concerned with sentence form and organization. Syntax investigates how motion verbs interact with other language factors to generate grammatical sentences in the setting of motion verbs. On the other hands, Lexical semantics is concerned

with the meaning and interpretation of individual words, particularly motion verbs. It studies how the semantics of a verb affects its role in expressing motion events.

According to Talmy, syntactic structure in languages can be classified into two main typological categories: Verb-framed and Satellite-framed languages. This classification is based on how different languages encode motion events.

First structure is Verb-framed languages: In verb-framed languages, such as English, the main information regarding motion is encoded in the verb. These languages tend to have a relatively simple syntax for encoding motion events. Second syntactic structure is Satellite-framed languages: In satellite-framed languages, such as Spanish or German, the main information regarding motion is encoded in particles or adverbs, often called "satellites."

To discuss if this language comes under verb framed or surface structure Talmy mentioned the lexicalization patterns of motion events. According to Talmy, languages differ in how they lexicalize motion events. In particular, he focuses on two main types of lexicalization patterns: manner of motion and path of motion.

3. Manner of motion: This type of lexicalization emphasizes the manner or style of how an entity moves. Languages that primarily focus on manner of motion tend to have a wide range of verbs that specifically describe different ways of moving. These verbs are often specific and precise, reflecting the finer details of motion.
4. Path of motion: This type of lexicalization emphasizes the path or trajectory along which an entity moves. Languages that focus on path of motion tend to have a rich inventory of spatial particles or prepositions that indicate the direction or location of motion. The verbs themselves may be more general and less specific about the manner of motion.

In verb-framed languages (such as English), the main information about motion is encoded in the verb itself. The path of motion is typically expressed as a separate prepositional phrase. The manner of motion and path are often distinct and can be separated grammatically. Example: “He walked into the room.” Here, “walked” represents the manner of motion, and “into the room” expresses the path. In satellite-framed languages (such as Spanish), the path of motion and the manner of motion are often expressed together within the verb, while additional particles or adverbs (satellites) provide further information. The path and the manner of motion are typically combined into a single verb.

4 Methodology

This section includes the research strategies, the methodology and the instrument the researcher used in the study. In addition, this section studied the sample of the study, as well as the instruments, data collection, and analysis. Finally, it shows the steps taken to accomplish the study’s objectives. Also, the instrument used to address the three main research questions:

5. How lexical semantic and syntactic structures show in English and Arabic motion verbs?
6. In which way motion verbs differ in English and Arabic languages?

4.1 Data Collection, Procedures and Instruments

The data for this study collected in two ways: first the researcher read the Around the World in Eighty Days novel to collect the sentences that used motion verbs in both languages. The researcher collected 14 Arabic and 14 English sentences include motion verbs. The second way is, using lexicology encyclopedia to refer to the origin, the specific meaning, and the use of motion in each language. Such as, Long man dictionary for English words, and Almujam Al-waset for English words. The third way is to see how these words used in dictionaries.

4.2 Data Analysis

The researcher limited this research by collecting 14 motion verbs. The data were analyzed by using the qualitative instruments. This method used to show the difference between motion verbs in each language, and the structure of using motion verbs in English and Arabic sentences.

After collecting the data the researcher translated English sentences into Arabic and gives the meaning of each verb in the sentence. For Arabic sentences she gave the English Transcription for each sentence then the meaning of the verbs.

5 Finding and Discussion

In this section, the researcher will present the finding of the current investigation, particularly to show the finding of syntactic and semantic structure of the motion verbs. In addition to show the differences of English motion verbs and their counterpart in Arabic. Finally, the researcher will discuss the finding of qualitative then to unpack each question and present the main findings based on the approach the researcher used during the research stages.

5.1 Findings

See Tables 1, 2, 3 and 4.

Table 1 The findings of motion verbs in English

No.	Expression	Main motion verb	Syntactic structure
1	A young man came in	Came	Manner: came Path: IN
2	I left France	Left	Manner and path: left
3	I come to England	Come	Manner: come Path: to England
4	Left the house	Left	Manner and path: left
5	He got up and went into the reading room	Got and Went	Manner: get up Path: went into
6	Run in a direct way	Run	Manner: run Path: in a direct line
7	Passepartout wandered with his hands in his pockets	Wandered	Manner: wandered Path: with his hands in his pockets
8	The pilot walked away a little distance	Walked	Manner: walked Path: away a little distance
9	Bands of monkeys skipped about in the trees	Skipped	Manner: skipped Path: in the trees
10	We are travelling so quickly	Travelling	Manner: so quickly Path: travelling
11	We left London	Left	Manner: left
12	They walked along	Walked	Manner: walked Path: along

6 Discussion

The researcher found 12 sentences used motion verbs in the Eighty days around the world Novel in both languages. These expressions are counterpart for each other. As mentioned the finding will be discussed based on Talmy's theory.

According to Talmy's theory we are going to discuss the findings by looking to Verbs Framed and Satellite-framed languages with the lexicalization of sentence structure.

As we see the way the same sentence translated into Arabic counterpart is differ from the English in the same Novel. In addition the way each dictionary used the same motion verb in the sentences completely differ.

Starting by the first English sentence" A young man came in" here the main verb is "Came" this verb act as a motion verb which shows the manner of the lexicalization and the path shows in the rest of the sentence by the preposition "in". Paying attention to the rest of the findings all the sentences the Manner found in the main verb and the path in the rest of the sentence.

In addition to the examples from the dictionary, "He came into the room and shut the door" here also the manner shows in the motion verb came and the path of the verb the way he came shows in "into the room."

Table 2 The findings of motion verbs frequency in Arabic

No.	Expression	Main motion verb	Transcription
1	دخل شاب	Dakhala	Dakhala shab
2	غادرت فرنسا	Ghadartu	Ghadirtu Faransa
3	أتيت الى انجلترا	Ataytu	Ataytu ila Injlitra
4	غادر البيت	Ghadar	Ghadar al-bayt
5	نهض ودخل غرفة القراءة	Nahatha and dakhala	Nahatha wadakhala ghurfat al-qira'ah
6	ركض بطريقة مباشرة	Rakad	Rakad bi tariqah mubashirah
7	تجول بصدر رحب مع يديه في جيبيه	Tajawwal	Tajawwal bi sadri rahabin ma yadayhi fi jaybayhi
8	سار الطيار بعيداً لمسافة قليلة	Sara	Sara al-tayyir ba'idan lilmasafah qaleelah
9	تجمعات من القرود تقفز هنا وهناك في الأشجار	Tuqaffuz	Tajma'at min al-qarud tuqaffuz huna wa huna fi al-ashjar
10	نحن نسافر بسرعة كبيرة	Nusafir	Nahnu nusafir bi sur'ah kabeerah
11	غادرنا لندن	Ghadarna	Ghadarna London
12	ساروا على طول	Saru	Sarau'ala tul

This findings agree with the previous studies mentioned that all English motion verbs come under the Verb framed structure, the verb structure took the motion as a manner and the rest show the path.

We can see the difference by looking to the same motion verb in Arabic language. The way both languages differ in using the same verb. Such as, "Dakhala shab" here the manner and the path showed in the verb. Also, in dictionary example " الفَصْلَ دَخَلَ الطَّالِبُ"" the motion verb consists of the manner and the path. And the word " "الفَصْلَ"" is additional information for the sentence.

As we can see there is no a prepositional phrase as English language sentences. Which the prepositional phrase includes the path and the motion includes the manner.

Table 3 The finding of motion verb in dictionaries English Oxford dictionaries

No.	Motion verb	Meaning	Example
1	Came	To move to or towards a person or place	He came into the room and shut the door
2	Left	To go away from a person or a place	She left the house by walking down the driveway around 8 this morning
3	Get Went	Get something to receive something To move or travel from one place to another	She got into the car and drove along the winding road He went up the stairs cautiously, taking one step at a time
4	Run	To move using your legs, going faster than when you walk	She ran down the street swiftly, trying to catch the bus
5	Wandered	To walk slowly around or to a place	They wandered through the dense forest, getting lost in its enchanting beauty
6	Walked	To move or go somewhere by putting one foot in front of the other on the ground	They walked along the scenic trail, enjoying the tranquility of the surrounding nature
7	Skipped	To move forwards lightly and quickly making a little jump with each step	She skipped joyfully down the path, her laughter echoing through the meadow
8	Travel	To go from one place to another, especially over a long distance	They are travelling across Europe, exploring different cities and immersing themselves in new cultures

6.1 Discussion of the Research Questions

1. How do motion verbs in English and Arabic differ in terms of lexicalization patterns?

By comparing the result of this study with the previous studies we can see that all languages differ from each other in using the same motion verb in the sentences. Not just English and Arabic languages differ from each other. In using English motion verb the path should be found in the prepositional phrase while the manner shows in the main motion verb. According to Talmy's theory the case of English motion verbs consider Verbs framed.

By contrast the Arabic used the manner and path in the motion verb and if there is any additional information in the sentence they don't consider as a path. Referring to Talmy's theory this case considers satellite framed structure.

So, to conclude the Motion verbs in English and Arabic differ in terms of lexicalization patterns. Fist, Verb Diversity: English tends to have a larger inventory of motion verbs compared to Arabic. English has a wide range of specific motion verbs, such as "walk," "run," "swim," "fly," and so on, each with a distinct meaning related to a specific type of motion. In contrast, Arabic often relies on more general verbs like "go" ((يذهب)) or "come" ((يأتي)) to express various types of motion. Second, Manner

Table 4 Almaany dictionary

No.	Motion verb	Example
1	Dakhala	دَخَلَ الطَّالِبُ الفَصْلَ
2	Ghadartu	غادَرْتُ المنزلَ صباحًا
3	Ataytu	أَتَيْتُ إلى الحَديقَةِ لِلتَنَزُّهِ
4	Ghadar	غَادَرَ الرَّجلُ المَنْزِلَ وَذَهَبَ إِلَى العَمَلِ
5	Nahatha & dakhala	نَهَضَ الطِفْلُ مِنَ الأَرِيكَةِ وَذَهَبَ إِلَى الغُرْفَةِ
6	Rakad	ركض الطفل في الحديقة
7	Tajawwal	تجَوَّلْتُ في السوق القديمة
8	Sara	سار الرجل على طول الشارع
9	Tuqaffuz	تَقَفَّزَتِ الفتاةُ فوق الحواجز
10	Nusafir	نَسَافِرُ إلى باريس في عطلة الصيف
11	Ghadarna	غادَرْنَا المدينة في الصباح الباكر
12	Saraw	في رحلتهم الطويلة، ساروا عبر الصحراء

versus Path: English motion verbs often prioritize manner of motion, focusing on how an action is performed. For example, "walk" emphasizes the manner of moving on foot. Arabic, on the other hand, tends to focus more on the path or direction of motion. It places greater emphasis on the destination or goal, rather than the specific manner of motion.

2. What are the syntactic structures employed in English and Arabic to represent motion events?

In both English and Arabic, various syntactic structures are employed to represent motion events. Here are some common syntactic structures used in each language:

In English, Simple Verb Phrases: English often uses simple verb phrases to express motion events, such as "run," "walk," or "jump." For example, "He runs to the park." Prepositional Phrases: English frequently employs prepositional phrases to indicate the path or manner of motion. For instance, "She walked across the bridge." In

addition to, Phrasal Verbs: English utilizes phrasal verbs, consisting of a verb and a particle, to express motion events. Examples include "set off," "take off," or "come in." For example, "The plane took off from the runway."

In Arabic, Verb-Subject-Object (VSO) Structure: Arabic commonly employs a Verb-Subject-Object structure to express motion events. For instance, " المدرسة ذهب الولد إلى" (The boy went to school). Verb-Object-Subject (VOS) Structure: Arabic also uses a Verb-Object-Subject structure to represent motion events. For example, " اللاعب الكرة رمى" (The player threw the ball). Prepositional Phrases: Arabic employs prepositional phrases to indicate the path or manner of motion, similar to English. For example, " سافر بالطائرة إلى الخارج" (He traveled by plane abroad). And finally, the Verb-Adverb Structure: Arabic uses verb-adverb structures to express motion events, where an adverb modifies the verb. For instance, " سبق بسرعة إلى النهاية" (He hurried quickly to the finish line).

7 Conclusion

In conclusion, this research paper explored the differences in the behavior of motion verbs in English and Arabic, utilizing dictionaries and the novel "Eighty Days Around the World" as data sources. The study adopted Talmy's theoretical framework, which provided a valuable lens to examine how these two languages encode and express motion events. Through the analysis, several notable distinctions emerged.

Firstly, the lexicalization patterns of motion verbs in English and Arabic were found to differ significantly. English exhibited a broader range of specific motion verbs, emphasizing manner of motion, while Arabic relied more on general verbs with a focus on the path or direction of movement. This distinction highlighted the different semantic preferences and linguistic strategies employed in the two languages.

Furthermore, the usage of dictionaries as a resource allowed for the identification and categorization of motion verbs in both English and Arabic. This comprehensive examination shed light on the nuances and subtle variations within the lexicon of motion verbs in each language. By examining multiple dictionaries, a more comprehensive understanding of the semantic and syntactic characteristics of these verbs was achieved.

Additionally, the analysis of "Eighty Days Around the World" as a literary text provided rich contextual examples of motion verb usage in both languages. This real-world data supported the findings from the dictionaries and allowed for a deeper exploration of how motion events are expressed and represented in English and Arabic narratives.

Overall, this research paper contributes to the existing body of knowledge by highlighting the differences in motion verb behavior between English and Arabic. The application of Talmy's theoretical framework proved instrumental in analyzing and understanding these distinctions. The use of dictionaries and literary texts as data sources enhanced the robustness of the study's findings. Further research in this area

can explore additional linguistic features and incorporate a broader range of texts to deepen our understanding of motion verb behavior in English and Arabic.

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Technological Influences on Radicalization and Strategies for Mitigating Violence



Aladdin Tarawneh and Alhareth Alhalalmeh

Abstract The path to radicalization is a gradual process, a series of gradual steps that involve acceptance of extremist views—and what constitutes an extremist view is, of course, a matter of debate. Radicalization often involves the reckless acceptance of violence as a means to achieve social goal, and this process is non-linear. This study adopts an analytical-descriptive approach that uses insights obtained from qualitative analysis of primary data to examine the sources and mechanisms of radicalization, its impact on violence, and the causes and consequences of these manifestations of human behavior. Of particular interest is how individuals use digital platforms, online forums and social media to spread extremist ideologies and engage in radicalization. Our analysis shows that radicalization is a long-term process that begins with a gradual shift towards extremist ideologies and ends with acts of violence. Our analysis of the role of technology in this process shows that social media has become an integral part of radicalization, and this knowledge is crucial in developing countermeasures to mitigate the effects of radicalization.

Keywords Radicalization · Technology · Causes of radicalization · Violence · Social media

1 Introduction

There is no commonly agreed definition of radicalization, much like the constant discussions surrounding the meaning of terrorism by authors such as [5, 9] [20: 874] defines radicalization as the basic process of people turning toward extremism.

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Its fundamental meaning is individuals gravitating towards violent acts based on extremist views.

Progressing towards terrorism requires a person to hold extremist views, but defining what qualifies as such views is vague. Should opposing societal values make one an extremist or does it require a coherent and recognized ideology? Must it support violence or relate to religion? The answers to these questions remain important yet unresolved, as declaring someone has radicalized connotes that they are on the dangerous path to terrorism. More than just indicating the shift towards a type of wrongdoing, it instigates an increase in the reactions from the establishment, various implications and nuances. It also suggests that an individual has advanced beyond the limit of lawful expressions or a stance of civic rebellion (even if it involves violence) to a point where it becomes ethically untenable. Significant social change must be condoned or encouraged by extremist views in order to justify state intervention that involves violence.

The UK's relationship between violence, extremism, and free speech is still blurry, even though it's clear that supporting ideas that go against the core values of a society, when there is no risk of harm, is important for a healthy democracy that upholds freedom of expression. This line may seem obvious, but it's not always that straightforward. Continues to target non-violent ideas, the Prevent strategy, according to the [2, 17]. Confusion arises when the terms 'radical' and 'extreme' are used to express non-terroristic ideologies and frameworks [21]. A person may present drastic proposals to change tax policies or resort to an 'extreme' regimen of diet and exercise. In some instances, such as with women's suffrage, certain thoughts were deemed 'radical' in a specific cultural moment but ultimately succeeded in fighting discrimination and promoting more equal treatment.

Radicalization can be either 'cognitive', where one adopts extremist beliefs, or 'behavioral', where one engages in extremist actions [21]. A critical question is whether radicalization occurs from adopting extremist views or from engaging in criminal conduct, such as terrorism. While public policy focuses on extremist behavior, the formation of extremist beliefs is still of paramount importance. Terrorism-related crimes exist in Western nations, which encompass activities from terrorist group recruitment to obtaining documents about terrorism [3]. However, the more critical matter at hand for CVE policy is the management of individuals susceptible to such actions, most notably minors who cannot be held accountable for legal violations. Beyond that, implementing primary prevention techniques through CVE programs can reduce risk of radicalization among a broader populace [13].

In effectively summarizing the fundamental essence of radicalization, Hafez and Mullins pinpoint how the process (1) gradually occurs through exposure to an extremist belief system, that (2) paves the way for violence despite it not being entirely inevitable (2015). Radicalization encompasses the acceptance of an extreme worldview (one that is not accepted by the broader society) that deems violence legitimate as a means to bring about sociopolitical transformation [11: 960].

Due to the intricate nature of current reports on radicalization, scholars have not reached consensus on how to craft a model for it. Nonetheless, certain elements are consistent across several models. Primarily, every model involves an individual who

adopts extremist views through self-identification with them. Additionally, connections to terrorist organizations or networks externally are significant contributors to this progression. Individuals' progression towards violence may be obtained through gradation models, even though the process does not follow a straightforward path. Upon reaching the end of this progression, it is feasible that an individual may opt to perpetrate a violent deed.

2 Methodology

Our focus is on using qualitative research methods to adopt an analytical descriptive approach that will help us identify the origins of radicalization and violence. To do this, we delve into verses with the intention of uncovering subtleties, themes, and contextual intricacies. Our ultimate objective is to shed light on the root causes of radicalization and promote awareness by offering nuanced insights. With our meticulous examination of the issue, we seek to offer a comprehensive view of the causes of radicalization, which will foster broader understanding of this complex case.

3 Roots of Radicalization

Despite significant research efforts, the why of individual radicalization cannot be pinpointed to a particular psychological profile [15]. Rather, the reasons are diverse and complex [4]. To better comprehend these various reasons, they are categorised into a framework encompassing technological, economic, social, ideological and psychological factors. Although the models above outline the process of radicalization, they do not delve into the multifaceted motivations driving this phenomenon [18].

Rather than competing alternatives, these factors contribute to piecing together the larger picture of radicalization as noted by [11].

Among the various reasons for radicalization, pure types do not exist. Ideology, and psychological factors frequently intersect. For instance, an extremist ideology may hinge on grievances, prompting an individual to resort to violent actions caused by feelings of anger or frustration [19]. While these categories provide a useful framework to grasp the primary causes of radicalization, they don't tell the whole story. Governments' national CVE policies are one way to evaluate how they understand radicalization.

3.1 Ideology

Ideological beliefs can deeply impact a person's perspectives and actions. These convictions can stem from various sources, such as religion, culture, or personal experiences. They often shape one's understanding of right and wrong, as well as their approach to problem-solving and decision-making. Sometimes, ideological differences can lead to conflicts and misunderstandings, but they can also foster diversity and creativity. It is essential to recognize and respect others' ideological differences, while also critically examining and challenging our own beliefs. Ultimately, the ability to navigate ideological diversity can contribute to personal growth and societal progress.

An extremist ideology is the root of terrorism—a statement that may appear self-evident or 'tautological' as per Guhl's observation. Violent pursuits are enabled by cognitive radicalization that follows the adoption of extremist notions.

Erroneous interpretations of Islam are often used to encourage violent attacks by terrorist groups. Many specific notions support this, such as the idea that Western societies are morally bankrupt. The promotion of the idea that the West is at war with Muslims and the acceptance of jihad and martyrdom as legitimate means are also common.

The concept of defending their faith is fundamental to Muslims, forming a significant part of their ideology. This ideology encompasses a comprehensive narrative about the one's position and the world living in it, and it often demonizes those who oppose it, justifying violence against them. By promising the possibility of heroic redemption, it encourages individuals to make sacrifices. In the opinion of [21: 880], terrorism is irrational when viewed outside the lens of these assumptions, rendering the behavior incomprehensible. Hoffman [14: 82] contends that religion is the foremost factor influencing terrorist activity.

3.2 Psychological

Psychological factors play a part in the radicalization process, despite the lack of a clear medical or psychological explanation. A prevalent trait is the quest for significance, particularly in individuals lacking self-esteem or a strong sense of identity. Such people are inclined to align themselves with social causes to feel valued and validated by others, contributing to their sense of belonging, worth, and purpose. Engaging in combat by travelling to Syria is considered by [24] as a way of becoming radicalized. The narrative of Islamic State, portraying it as a place where young men can seek personal fulfilment and come of age, is a major draw for many.

Terrorist behavior cannot be solely attributed to a search for identity, as many individuals lacking self-confidence do not engage in such activities. Nevertheless, this factor, along with group dynamics, appears to be crucial in the recruitment of young members by terrorist groups, such as Islamic State, worldwide [9].

3.3 Social

Various studies [8, 11, 19] have highlighted the importance of social relationships in the context of radicalisation. This is true not just for Islamist terrorism, but also left-wing and right-wing terrorism, gang activity, and cult membership. Radicalisation is a "group phenomenon," as explained by [6: 27], where new members are encouraged to adopt the group ideology by friends, family, and other members. The studies of Maskaliūnaite, [19] clarify that the influence exerted on potential members varies from gentle persuasion to forceful coercion.

In 2015, Christmann mentioned that a range of techniques, like group polarization, peer pressure, group bonding, and isolation, make the process more accessible (2012: 27).

Influence on the radicalization of young recruits is largely influenced by the psychological yearning for a sense of meaning and purpose. Groups can capitalize on this aspiration and utilize it to their advantage. Psychological fulfillment is an important pursuit satisfied through group participation [16]. Moreover, groups can exacerbate the repercussions of leaving once someone has joined. Even if someone loses confidence in the group's ideology, approaches, or methods, departing from the group may be challenging. Leaving extremist groups can be accompanied by a flood of emotions such as guilt, anxiety, and loyalty [11]. There is a chance of retribution from the group or the state for departing, which can also be unnerving. Regardless, extricating oneself from such ideologies comes with a heavy price, be it psychological, emotional, or physical [11: 965].

3.4 Economic

Terrorist attacks are often carried out by individuals who are not economically disadvantaged or lacking education [25]. As a result, it cannot be assumed that those with low socio-economic status are at an increased risk of becoming terrorists. Moreover, studies conducted by [22] have disproved the idea that poverty-stricken countries experience more terrorism.

The connection between socio-economic disadvantage and radicalization can be attributed to the exasperating realization of injustice. 'Relative deprivation' theory posits that when a person discovers that others have better living conditions or societal prestige, and views these differences as unfair, they are inclined towards extreme views [6]. Christmann proposes that this sense of relative deprivation can be felt either as an individual, a group or on an international level (2012).

Relevance of economic disparity is intertwined with fostering an environment for radicalization, especially when coupled with personal experiences of discrimination. A 2015 analysis by Hafez and Mullins (p. 962) reveals that Muslim enclaves in Europe frequently encounter a sense of isolation and bias, often leading to an increase in criminal activities within these communities.

Amidst various studies that have been conducted, a significant link has been found between extremism and minority discrimination. In Europe and the US, over 2500 Muslims took part in a study which revealed a strong connection between Muslims' perceived discrimination and the belief that suicide bombing is justified. Similarly, in a study of 172 countries, it was discovered that economic discrimination against minority groups could lead to an escalated risk of terrorism [22].

3.5 Technological

From around the globe, young fighters have been successfully recruited by Islamic State through its use of technology. Posting slick propaganda clips on Twitter, YouTube and Facebook has been crucial to its radicalization efforts. As a result, technology is now recognized as a significant contributing factor to the issue. Using the best method for attracting young people, Al-Tarawneh [3] suggests that this tactic addresses the targeted recruits directly through the medium that resonates most with these individuals.

Without the Internet, Islamic State would not have been able to reach so far and wide. But the connection between online viewing of extremist content and radicalization is not clearly understood. It seems that more often than not, people are first radicalized through group networks and social circles, and only then do they turn to extremist material online. Through merely being exposed to extremist content online and lacking any human interaction, self-radicalization becomes less frequent [26]. Conway maintains that there is "not yet established evidence that links the consumption and networking around violent extremist online material to the acceptance of extremist ideology or participation in terrorism and violent extremism" [7: 77].

4 Violence Counter-Measures Policies

As a gradual process, the adoption of extremist ideology is accurately represented in the policies of different countries. The core nature of radicalization is captured by these policies. In 2007, the Netherlands' action plan had a broader definition of radicalization which included the "willingness to strive for far-reaching changes in society (possibly in an undemocratic manner), to support such changes or persuade others to accept them" (Al-Tarawneh, 20: 5). However, the current definition is much more limited. This difference could have significant implications, potentially leading to legitimate forms of dissent such as industrial action or political protest being falsely grouped in with dangerous radicalization. The Ministry of Security and Justice [20: 33] defined radicalization as an 'attitude', but this oversimplified the process by failing to recognize its gradual and complex nature. The definition implied that a mere change in perspective would lead to radicalization, which is far from the truth.

Targeting the extremism's core nature and linking it to the potential for violent action, these policies hold true throughout all countries except the UK. Australia hones in on violent extremism, where individuals or groups believe that terror, fear, and violence are justified to fulfil political, ideological, or social change, and then proceed to act on these beliefs [1]. Meanwhile, Sweden defines violent ideology as the acceptance of violence and possibly committing ideologically motivated crimes. The adoption of this violent ideology is deemed to be the point where individuals become extreme. Rather than targeting violent extremism specifically, Denmark's approach focuses on addressing extremism that seeks to legitimize violence according to their government's definition [10: 7]. Meanwhile, in the Netherlands, extremism is now connected to…

As per the Ministry of Security and Justice, performing illegal actions and going against the law is equivalent to showing aggression (2014: 31). Furthermore, these techniques are targeted towards behavioral transformation, and the possibility of carrying out a violent act is not negligible.

In the latest review of CONTEST by the Home Office in 2018, the once combative language targeting terrorism's cultural and ideological threat has been significantly toned down. The revised document places a greater emphasis on the threat posed by right-wing extremism while highlighting the efficacy of a multi-agency approach and public–private partnerships. Meanwhile, the Prevent strand reverts back to the objective of fortifying community resilience against extremist influences, albeit with a continuing emphasis on ideology being a potent factor in radicalization, albeit with less recognition given to other factors [2]. The al-Qaeda and Islamic State ideologies are still the subject of much attention. Present-day Prevent and Counter-Extremism techniques are based on the initiatives issued by the Home Office in 2011 and 2015.

Across the board, positive features can be found, though they vary significantly in nature. Contrary to popular belief, research has shown that ideology and technology are not the main catalysts for radicalization. Rather, social networks and psychology have been identified as the primary motivators, yet government policy has yet to fully embrace these findings. In the Netherlands, terrorism has been linked to integration issues, despite the absence of empirical evidence to support this claim [23]. In terms of accurately defining the root causes of radicalization, there is certainly room for improvement. Interestingly, despite a lack of evidence to support the claim, Australia often associates prior criminal behavior with the process of radicalization.

5 Conclusion

The view on radicalization seems to vary from person to person, no clear model seems to exist, and its causes are intricate and multifarious. Nevertheless, there are enough recurring themes featured in the literature to form some overall notions. Radicalization is not a swift process, but rather a gradual one, whereby an individual becomes more connected and committed to an extremist ideology that can lead to violent actions. Extremist viewpoints are ones that advocate the use of violence

to affect political or religious change. External groups and networks are crucial in influencing this progression.

Embarking on this process involves complex reasons that cannot be attributed to an economic profile or singular psychological. Those lacking self-esteem and a solid sense of self could be convinced, twisted, or forced into extremist beliefs by terrorist organizations, particularly among youth. Where there are political grievances (such as concerns over Western intervention in the Middle East), economic inequality (particularly when coupled with minority discrimination) plays a significant role. Radicalization concerns are exacerbated with technology, which enables terrorist organizations to spread their message worldwide and connect directly with younger people.

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The Role of Intellectual Capital in Achieving Competitive Advantage: An Empirical Study of Pharmaceutical Manufacturing Companies



Majid Abdul-Mahdi Masadeh, Marah Masadeh, and Farah Masadeh

Abstract The objective of the study is to explore how "intellectual capital," which consists of three components—human capital, structural capital, and relational capital—contributes to attaining "competitive advantage," characterized by its elements of "superior quality, superior efficiency, superior responsiveness, and superior innovation" within the pharmaceutical manufacturing industry. This research will be approached from the viewpoint of all employees working in pharmaceutical manufacturing firms, including managers, their assistants, department heads, and staff members. Employing a descriptive-analytical methodology, the study utilized a questionnaire as the primary instrument for assessing the study variables. Employees from Dar Al Dawa, Hayat Pharmaceutical Industries Co., and Philadelphia Pharmaceuticals, all of which are listed on the Stock Exchange, were the focus of the study. The total population consisted of 1168 employees, while the sample comprised 303 individuals. Data analysis and hypothesis testing were carried out using the Statistical Package for the Social Sciences (SPSS) software. The study concluded with several findings, the most significant being that the dimensions of intellectual capital play a role in achieving competitive advantage. Furthermore, the strongest influence on competitive advantage within companies is attributed to structural capital. The research also provided several recommendations, with the most crucial being the imperative for pharmaceutical firms to implement policies and strategies aimed at fostering intellectual capital and creating a specialized customer management department to improve communication, gather feedback, and comprehend evolving needs.

Keywords Intellectual capital · Human capital · Structural capital · Relational capital · Competitive advantage · Superior quality · Superior efficiency · Pharmaceutical manufacturing · SPSS · Customer management

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1 Introduction

In a global economy that relies on knowledge and human skills, there is an increasing worldwide recognition of intellectual capital, its cognitive aspects, and the considerable value it generates. This recognition arises from evaluating the present conditions of economic institutions, prompting companies to pursue intellectual assets, talents, and innovative concepts within their workforce. They then identify these resources and make suitable investments in them to boost profits and improve their competitive edge and strategic position [11].

Human assets associated with information, knowledge, and intellectual property, including patents, trademarks, and structural elements tied to organizational frameworks and processes, make up intellectual capital [6]. Additionally, it encompasses the quality of relationships between the company and its partners. The unique creative talents of employees are a manifestation of intellectual capital, allowing them to generate novel ideas or refine and implement existing ones to gain a competitive edge [9].

In light of changes within the competitive landscape, businesses in multiple industries must improve their competitive edge to fortify their standing in the market [7]. Research conducted across diverse productive and service sectors has underscored the significance of intellectual capital in enhancing a company's competitive advantage. Among the key assets that can bolster this advantage are knowledge and advanced skills that foster innovation, as earlier studies have pointed to a transition from an information economy to one driven by knowledge and intelligent thinking. This transition ensures reliable financial resources for project funding [11].

1.1 Research Problem and Questions

The pharmaceutical industry is experiencing ongoing dynamic transformations driven by its global accessibility. As a result, pharmaceutical manufacturing firms in Jordan are working to enhance their market shares in comparison to both local and international competitors. In pursuit of this goal, these companies have endeavored to advance their material capabilities and fundamental competencies by emphasizing intellectual capital, leading to numerous achievements on local, regional, and global scales. However, a review of the literature for this study reveals a lack of research that addresses the relationship between intellectual capital and competitive advantage within the critically important sector of Jordanian pharmaceutical manufacturing.

Jordanian pharmaceutical firms were quick to acknowledge the importance of developing exceptional intellectual capital to implement their diverse competitive strategies and secure an edge by meeting the needs of human, structural, and relational capital.

Based on the above, the research problem involves the following questions:

- What role can intellectual capital play in achieving the competitive advantage of Jordanian pharmaceutical manufacturing companies?
- What are the key practices these companies adopt concerning their intellectual capital?
- What are the practical aspects of competitive advantage that they rely on to maintain their target markets?
- Have they been able to achieve the competitive advantage derived from employing intellectual capital?

1.2 Significance of the Study

The significance of this study can be divided into two types:

- **Academic Significance**: The present study holds significant academic value as it seeks to investigate the characteristics of intellectual capital and the elements that contribute to competitive advantage in Jordanian pharmaceutical manufacturing firms, positioning itself as a model for developing nations. Furthermore, it aids in establishing a knowledge foundation for researchers and individuals keen on examining this topic from the viewpoint of employees in a critical industry.
- **Practical Significance**: The importance of this study lies in the need to emphasize intellectual capital and its contribution to gaining a competitive edge. The researchers seek to present a collection of findings and suggestions that may aid these companies in reaching their objectives. To the best of the researcher's knowledge, this study is among the rare ones that integrate intellectual capital with competitive advantage within Jordan's pharmaceutical manufacturing sector. More specifically, the practical significance of this study can be summarized as follows:

1. Supporting the management team of Jordanian pharmaceutical companies in assessing their intellectual capital and recognizing its importance as a key element in creating value and achieving sustainable competitive advantage.
2. Identifying competitive advantage in the Jordanian pharmaceutical sector.
3. Understanding the relationship between the application of intellectual capital dimensions and enhancing the competitive position of the Jordanian pharmaceutical sector.
4. Providing recommendations to assist in the development of programs and plans that can help increase intellectual capital in these companies.
5. Offering a greater opportunity to assess the true state of your intellectual capital, recognize its strengths and weaknesses and help in its development.

1.3 Research Objectives

This study seeks to fulfil the following objectives:

- To determine the extent to which dimensions of intellectual capital—namely human capital, structural capital and relational capital—are present in Jordanian pharmaceutical companies.
- Uncovering the Level of Competitive Advantage in Jordanian Pharmaceutical Companies.
- Understanding the role of intellectual capital and its components in achieving competitive advantage in Jordanian pharmaceutical companies.
- Pinpointing the most crucial dimensions of intellectual capital in Jordanian pharmaceutical companies.
- Presenting proposals to help Jordanian pharmaceutical companies increase their intellectual capital and develop competitive advantage based on the study results.

2 Literature Review

2.1 Intellectual Capital

Concept of "Intellectual Capital"

Intellectual Capital (IC) signifies the true capital of organizations and has evolved to include all available physical, financial, moral, cultural, and intellectual resources. Academics and practitioners have offered various interpretations of intellectual capital. Cabrilo [9] articulates that IC comprises "a set of skills available in the company that possesses extensive knowledge, enabling it to become global by responding to beneficiary requirements and opportunities offered by technology." Farhati [10] describes it as the overarching framework within which knowledge management serves as the driving force, highlighting the possession of knowledge alongside the application of expertise, skills, technologies, relationships, and tools necessary for the company to realize its strategies. According to Boon et al. [8], it is the intellectual assets that encompass "knowledge, information, intellectual property, and experience" utilized to generate wealth, emphasizing that the management and assessment of IC have become crucial elements for contemporary companies. Kianto et al. [15] view it as a collection of informational resources consisting of two categories of knowledge: explicit knowledge, which can be easily articulated or documented and shared with others, and tacit knowledge, rooted in personal experiences and principles applied in the growth of the company. According to Hejazi et al. [14], it is regarded as "a distinctive ability that sets the company apart from its rivals, accomplished through the amalgamation of different skills and contributing to the enhancement of value.

Importance of Intellectual Capital

The significance of intellectual capital has notably risen within companies, serving as a key catalyst for innovation and creativity. Effectively managing this vital component is essential for optimal investment and preservation. Managing intellectual capital as

a strategic asset involves several steps, beginning with the investment in knowledge as a primary force to enhance value [2]. Following this is the alignment of revenues with intellectual assets to create advantages, which includes developing strategies to invest in and leverage these assets, ultimately aiming to boost the productivity of intellectual capital and explore new methods of measurement. Furthermore, Al-Anzi and Saleh [3] emphasized that intellectual capital holds significant prestige for certain entities, favoring them above others, as it pertains to the establishment of intelligent companies, successful investments, high returns, and serves as a strategic resource and competitive tool in the knowledge economy. Focusing on intellectual capital brings a multitude of benefits, such as enhanced creative capabilities, attracting stakeholders and fostering their loyalty, increasing competition by accelerating the introduction of new products, decreasing the time between innovations, lowering costs, facilitating competitive pricing, and "improving productivity and enhancing competitive ability".

2.2 Competitive Advantage

Concept of Competitive Advantage

There is no consensus among researchers in economics and management regarding a single definition of competitive advantage. While economists interpret competitiveness as "national competition" and advocate for macro-level analytical approaches, management researchers argue that the focus should be on micro-level tools that examine the competitive advantages each company encounters in relation to its rivals [18].

Competitive advantage refers to "a collection of skills, techniques, technologies, or unique resources that enable a company to deliver value and benefits to customers that surpass those provided by competitors, highlighting the company's uniqueness and distinction from the viewpoint of the beneficiaries, who recognize this superiority and difference, as it offers them greater benefits and values than other competitors". Additionally, it is described as "an element of a company's advantage or superiority attained through the adoption of a particular competitive strategy" [17].

A company achieves competitive advantage when it can execute its activities more efficiently and at a lower cost than its rivals by optimizing resources or showcasing its skills in a way that customers perceive as offering greater value [5]. According to [4–7], this advantage is characterized by the company's capacity to operate in ways that competitors cannot currently or will not be able to replicate in the future, utilizing its internal strengths. Al-Harthy [4], Al-Kameem [5] offer a more precise definition, asserting that competitive advantage is realized when a company identifies new and more effective methods compared to those employed by competitors, concentrating on its core creativity, and successfully implements this discovery during the innovation process.

Importance of Competitive Advantage

Quaye and Mensah [16] see the importance of competitive advantage as follows:

- Creating value for customers that meets their needs and ensures their loyalty, supporting the company and improving its reputation and image in their minds.
- Achieving strategic distinction from competitors in the goods and services offered to customers, with the potential for distinction in resources, competencies, and strategies in a highly competitive environment.
- Attaining a market share that ensures high profitability for the company's survival and continuity.
- Ensuring the company's survival and continuity by achieving higher profits.

Elements of Competitive Advantage

The essential elements of competitive advantage include:

1. **Quality**: It refers to the attributes and specifications inherent in a specific product that fulfill the requirements of both current and potential beneficiaries, serving as a crucial component for the success of businesses and a vital element in competition within both domestic and global markets. It is described as a collection of factors or traits that must be included in a product or service to satisfy market demands (Al-Ameen 2018). Furthermore, it provides a means for companies to differentiate themselves, enhancing their separation from rivals [12].
2. **Resources**: The availability of company resources and capabilities enables it to consistently provide competitive service to customers [13].
3. **Cost Elements**: The "cost elements" are crucial factors employed by the company, including:
   - "Economies of scale," where the company covers its usual costs.
   - "Marketing costs," which are costs borne by the product from its departure from the factory until it reaches distribution channels and is presented to the consumer.
   - "Product design," which enhances production efficiency through continuous monitoring.
   - "Experience," which is considered a source of competitive advantage [4].
4. **Knowledge Management**: It has become a vital and effective element, forming a source of increased competitive advantage, resulting from individuals' experiences and what they rely on in performing their work [2, 17, 18].

Dimensions of Achieving Competitive Advantage

These represent the traits that a company selects and emphasizes in its approach to providing products and addressing market needs in order to attain a competitive edge. This is accomplished by optimally utilizing technical, material, financial, and organizational resources, in conjunction with the skills, expertise, and knowledge that empower the company to formulate and execute competitive strategies [1].

- **Perceived Value to the Beneficiary**: The exploitation of diverse capabilities that increase the worth of goods and services is essential for establishing and

attaining a competitive edge. The notion of value encompasses aspects such as price, quality, satisfaction with products or services, and after-sales support, all of which contribute to the beneficiary feeling they have gained greater value from their interactions with the company. This perception fosters repeat business and strengthens that competitive advantage. Furthermore, effectively managing "intellectual capital" is vital in bolstering the perceived value for the beneficiary, serving as "a fundamental pillar for achieving competitive advantage by focusing on its components and providing the competencies that meet those needs [11, 13, 14]".

- **Excellence**: Achieving a competitive advantage hinges on providing a service that is not easily replicated or imitated, while making the most of available resources and capabilities. Significant contributors to excellence encompass "organizational capabilities, intellectual capital, and financial resources" [1].

3 Study Methodology and Procedures

3.1 Study Methodology

The descriptive-analytical method was utilized by the researchers, recognized as the most appropriate strategy for the study's nature. This methodology facilitated an examination of both the theoretical and quantitative dimensions of the research. Initially, the phenomenon and the problem under investigation were theoretically outlined, succeeded by an extensive quantitative analysis of the data gathered from the sample. This approach proved crucial for evaluating the hypotheses and extracting the main findings.

3.2 Study Population

This study's population comprises employees from pharmaceutical companies in Jordan that are listed on the Amman Stock Exchange. Included among these companies are "Dar Al Dawa," "Hayat Pharmaceutical Industries Co.," and "Philadelphia Pharmaceutical Industries Co." Approximately 1168 employees make up the study population, with their data collected via the Human Resources department of each respective company.

3.3 Reliability

Reliability pertains to the consistency of measurements obtained each time they are Table 1 assessed. A measuring instrument that yields inconsistent outcomes upon

Table 1 Cronbach's Alpha reliability coefficients

Variable	Number of items	Item numbers	Cronbach's Alpha
Human capital	10	1–10	0.842
Structural capital management	10	11–20	0.855
Relational capital management	10	21–30	0.847
Superior quality	5	31–35	0.803
Superior efficiency	5	36–40	0.802
Superior innovation	5	41–45	0.829
Superior responsiveness	5	50–56	0.803
Overall Performance	50	–	0.943

repeated use cannot be deemed reliable [1]. Quantitative assessment of reliability is conducted through reliability coefficients, which range from 0 to 1. Typically, a Cronbach's alpha coefficient below 0.4 signifies low reliability, while a coefficient falling between 0.4 and 0.7 is regarded as moderate. A coefficient exceeding 0.7 is interpreted as high, suggesting that the reliability of the survey items should not be below 0.7. The Cronbach's alpha coefficients for the variables in this study are displayed in Table 7.

The Cronbach's alpha coefficients for the items, as illustrated in Table 1, vary from 0.803 to 0.855, all surpassing the reliability benchmark of 0.7. This demonstrates that every item is considered reliable, with "Structural Capital Management" identified as the most dependable variable, boasting a coefficient of 0.855, whereas "Superior Efficiency" recorded the lowest reliability at a coefficient of 0.802. Overall, the reliability of the items is impressively high, achieving a coefficient of 0.943.

3.4 Dimensions of the Dependent Variable: Competitive Advantage

The measurement of competitive advantage was conducted across four dimensions: superior quality, superior efficiency, superior innovation, and superior responsiveness. The opinions of the sample members were evaluated using "arithmetic means and standard deviations" for the items related to the dimensions of the dependent variable. To gauge how companies attain and maintain a competitive advantage from the viewpoint of the study sample, the analysis depended on the "arithmetic means" of the dimensions associated with the "competitive advantage" variable. Table 2 presents the results.

Table 2 clearly shows that "superior efficiency" holds the highest arithmetic mean among the dimensions of competitive advantage, registering a value of 3.66. In contrast, "superior responsiveness" has the lowest value at 3.34. Both dimensions fall within the medium relative importance category. Additionally, the competitive

Table 2 Arithmetic means of the dimensions of the dependent variable

Variables	Rank	Arithmetic mean	Relative importance
1. Superior quality	2	3.57	Medium
2. Superior efficiency	1	3.66	Medium
3. Superior innovation	3	3.42	Medium
4. Superior responsiveness	4	3.34	Medium
Competitive advantage		3.49	Medium

Table 3 Variance inflation factor (VIF) and tolerance

Variable	VIF	Tolerance
Human capital	2.487	0.402
Structural capital	3.863	0.259
Relational capital	2.473	0.404

advantage variable achieved a medium relative importance as well, with a value of 3.49, signifying that sample members perceive its level as medium.

To confirm that the variables were unaffected by this phenomenon, the tests for the "Tolerance" coefficient and "Variance Inflation Factor (VIF)" were employed. The results are depicted in Table 3.

In order to confirm that the independent variables are not affected by "multicollinearity," the VIF must remain below 10, while the Tolerance should exceed 0.1. The table clearly shows that the VIFs for the independent variables fall below 10 and that the Tolerance coefficients are above 0.1, demonstrating that multicollinearity is absent in the data [17].

Once it was established that the data adhered to a normal distribution and was devoid of "multicollinearity," several linear regression analyses were conducted to evaluate the hypotheses.

4 Hypothesis Testing in the Study

4.1 Testing the First Main Hypothesis

- **HO1**: "There is no statistically significant role at the significance level ($\alpha \leq 0.05$) for intellectual capital, as represented by its dimensions (human capital, structural capital, and relational capital), in achieving competitive advantage, as represented by its dimensions (quality, innovation, responsiveness, and efficiency), in Jordanian pharmaceutical manufacturing companies."

To test this hypothesis, "multiple linear regression analysis" was used. The main hypothesis was tested at a significance level of ($\alpha \leq 0.05$), as shown in Table 4.

Table 4 Results of multiple linear regression analysis for testing the first main hypothesis

Dependent variable	R	R^2	F-calculated	Degrees of freedom	Significance level (Sig)	Independent variable	B value	t value	Significance level (Sig)
Competitive advantage	0.876	0.767	327.512	3	0.000	Intellectual capital	0.114	2.528	0.012
				299		Structural capital	0.423	8.104	0.000
				302		Relational capital	0.379	8.978	0.000

Table 5 Results of stepwise linear regression for the first main hypothesis

Model	R	R^2	F-calculated	Significance level (Sig)
1	Structural capital	0.835	0.698	694.366
2	Structural capital, relational capital	0.873	0.762	479.457
3	Structural capital, relational capital, human capital	0.876	0.767	327.512

- **F-Calculated versus F-Table Value**: The calculated F value (327.512) is higher than the table value (2.61), confirming the significance of the regression model used in the analysis.
- **Significance Level**: The significance level for F (0.000) is lower than the threshold set by the study (0.05), resulting in the rejection of the primary hypothesis and the endorsement of the alternative: Intellectual capital, through its dimensions (human capital, structural capital, and relational capital), plays a statistically significant role at the significance level ($\alpha \leq 0.05$) in attaining competitive advantage, which is defined by its dimensions (quality, innovation, responsiveness, and efficiency), within Jordanian pharmaceutical manufacturing firms.
- **Correlation (R Value)**: An R value of 0.876 suggests a robust correlation between the dimensions of the independent variable—namely "human capital, structural capital, and relational capital"—and the dependent variable "competitive advantage," as it exceeds the threshold of 0.5 Table 5.

4.2 Testing the First Sub-hypothesis

- **HO1-1**: "There is no statistically significant role at the significance level ($\alpha \leq 0.05$) for intellectual capital, as represented by its dimensions (human capital, structural capital, and relational capital), on the dimension (superior quality) as one of the competitive advantage dimensions in Jordanian pharmaceutical manufacturing companies."
- Multiple linear regression analysis was used to test the hypothesis at a significance level of ($\alpha \leq 0.05$), as shown in Table 6.

- **F-Calculated versus F-Table Value**: The calculated F value (330.010) is higher than the table value (2.61), confirming the significance of the regression model used.
- **Significance Level**: The significance level chosen for the study (0.05) exceeds the F significance level (0.000), resulting in the rejection of the initial sub-hypothesis and the acceptance of the alternative: At the significance level ($\alpha \leq 0.05$), intellectual capital—encompassing its dimensions of human, structural, and relational capital—plays a statistically significant role in the dimension of superior

Table 6 Results of multiple linear regression analysis for testing the first sub-hypothesis

Dependent variable	R	R^2	F-calculated	Degrees of freedom	Significance level (Sig)	Independent variable	B value	t value	Significance level (Sig)
Superior quality	0.866	0.749	330.010	3	0.000	Intellectual capital	0.196	4.065	0.000
				299		Structural capital	0.308	5.499	0.000
				302		Relational capital	0.499	11.025	0.000

Table 7 Results of multiple linear regression analysis for testing the second sub-hypothesis

Dependent Variable	R	R^2	F-Calculated	Degrees of Freedom	Significance Level (Sig)	Independent Variable	B Value	t Value	Significance Level (Sig)
Superior Efficiency	0.796	0.633	172.061	3	0.000	Intellectual Capital	0.076	1.227	0.221
				299		Structural Capital	0.283	3.965	0.000
				302		Relational Capital	0.540	9.361	0.000

quality, which is considered a competitive advantage in Jordanian pharmaceutical manufacturing firms.

4.3 Testing the Second Sub-Hypothesis

- **HO1-2**: "There is no statistically significant role at the significance level ($\alpha \leq 0.05$) for intellectual capital, as represented by its dimensions (human capital, structural capital, and relational capital), on the dimension (superior efficiency) as one of the competitive advantage dimensions in Jordanian pharmaceutical manufacturing companies."
- Multiple linear regression analysis was used to test the hypothesis at a significance level of ($\alpha \leq 0.05$), as shown in Table 7.

- **F-Calculated versus F-Table Value**: The calculated F value (172.061) is higher than the table value (2.61), confirming the significance of the regression model used.
- **Significance Level**: The significance level chosen for the study (0.05) exceeds the F significance level (0.000), resulting in the rejection of the second sub-hypothesis and the acceptance of the alternative: At the significance level ($\alpha \leq 0.05$), intellectual capital—encompassing its components (human capital, structural capital, and relational capital)—plays a statistically significant role in the dimension of superior efficiency, which is a key aspect of competitive advantage within Jordanian pharmaceutical manufacturing firms.
- **Correlation (R Value)**: The R value of 0.796 indicates a strong correlation between the independent variable's dimensions and the dependent variable "superior efficiency," as it is greater than (0.5).

4.4 Testing the Third Sub-hypothesis

- **HO1-3**: "There is no statistically significant role at the significance level ($\alpha \leq 0.05$) for intellectual capital, as represented by its dimensions (human capital, structural capital, and relational capital), on the dimension (superior innovation) as one of the competitive advantage dimensions in Jordanian pharmaceutical manufacturing companies."
- Multiple linear regression analysis was used to test the hypothesis at a significance level of ($\alpha \leq 0.05$), as shown in Table 8.

- **F-Calculated versus F-Table Value**: The calculated F value (159.224) is higher than the table value (2.61), confirming the significance of the regression model used.

Table 8 Results of multiple linear regression analysis for testing the third sub-hypothesis

Dependent variable	R	R^2	F-calculated	Degrees of freedom	Significance level (Sig)	Independent variable	B value	t value	Significance level (Sig)
Superior innovation	0.784	0.615	159.224	3	0.000	Intellectual capital	0.077	1.174	0.241
				299		Structural capital	0.518	6.817	0.000
				302		Relational capital	0.322	5.233	0.000

- **Significance Level**: The significance level set by the study (0.05) exceeds the F significance level (0.000), resulting in the rejection of the third sub-hypothesis and the acceptance of the alternative: At a significance level ($\alpha \leq 0.05$), intellectual capital—encompassing human, structural, and relational capital—plays a statistically significant role in the dimension of superior innovation, which is considered one of the competitive advantages in Jordanian pharmaceutical manufacturing firms.

4.5 Testing the Fourth Sub-hypothesis

- **HO1-4**: "There is no statistically significant role at the significance level ($\alpha \leq 0.05$) for intellectual capital, as represented by its dimensions (human capital, structural capital, and relational capital), on the dimension (superior responsiveness) as one of the competitive advantage dimensions in Jordanian pharmaceutical manufacturing companies."
- Multiple linear regression analysis was used to test the hypothesis at a significance level of ($\alpha \leq 0.05$), as shown in Table 8.

- **F-Calculated versus F-Table Value**: The calculated F value (114.951) is higher than the table value (2.61), confirming the significance of the regression model used Table 9.
- **Significance Level**: The significance level chosen for the study (0.05) exceeds the F significance level (0.000), resulting in the dismissal of the fourth sub-hypothesis and the endorsement of the alternative: "At the significance level ($\alpha \leq 0.05$), intellectual capital—encompassing its components of human capital, structural capital, and relational capital—plays a statistically significant role in the dimension of superior responsiveness, which is considered a competitive advantage in Jordanian pharmaceutical manufacturing firms.
- **Correlation (R Value)**: From the R value, it can be concluded that there is a correlation between the "independent variables" and the "dependent variable". The results indicated that the correlation coefficient is 0.775, which indicates a strong relationship between the independent variable and the dependent variable higher responsiveness as it is greater than 0.5.
- The results confirmed that there is an explanatory power of the dimensions of the independent variable combined: human capital, structural capital and relational capital and the dependent variable higher responsiveness of 60.0%, as shown by the value of the coefficient of determination, $R2 = 0.600$.

Table 9 Results of multiple linear regression analysis for testing the fourth sub-hypothesis

Dependent variable	R	R^2	F-calculated	Degrees of freedom	Significance level (Sig)	Independent variable	B value	t value	Significance level (Sig)
Superior responsiveness	0.775	0.600	149.807	3	0.000	Intellectual capital	0.102	1.582	1.582
				299		Structural capital	0.498	6.681	0.000
				302		Relational capital	0.222	3.458	0.001

5 Results

The achievement of competitive advantage is significantly influenced by structural capital, human capital, and relational capital. Findings indicate a statistically significant relationship between intellectual capital and competitive advantage, highlighting its crucial role; any alterations in this capital will yield a considerable and positive impact. Furthermore, intellectual capital accounts for an impressive 76.7% of the explanatory power in attaining competitive advantage. Additionally, the enhancement of these dimensions positively affects performance. Among the various components of intellectual capital, structural capital exhibits the highest explanatory power for boosting competitive advantage. The results of this study are consistent with those from multiple other research efforts, including [4, 5, 12], and they also corroborate [16, 18] findings, which emphasize the significant influence of intellectual capital dimensions on enhancing competitive capabilities, among other factors.

6 Recommendations

- Pharmaceutical companies should adopt methods and strategies aimed at developing intellectual capital in all its dimensions, based on a comprehensive analysis of all aspects of the enterprise and engaging employee participation.
- Creation of a dedicated customer relationship management department to improve communication with customers, collect opinions on the company's products and identify changes in their needs.
- Engage a group of researchers and experts in pharmaceutical and marketing to conduct scientific research on medicinal products and study market changes to improve the company's ability to seize opportunities.
- Adopt a transparency policy that allows employees to access company policies and provide input into future strategies.
- Create a system of financial and moral incentives that will stimulate employee creativity and provide all the necessary technological tools.
- Increase the skills and capabilities of your employees so that they can perform their tasks efficiently and with high quality.
- Review the company's activities on an ongoing basis, analyze costs and waste in the production process, and eliminate activities that increase production costs.

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Modern Technology as a Tool for Copyright Protection: Evaluating the Effectiveness of Digital Solutions in the Electronic Environment



Omar Al Makhzoumi and Jaber Al-Ghayathin

Abstract This research investigates copyright and electronic works within the digital landscape, shedding light on the legal framework and the challenges encountered in their protection. Several key objectives guide this study, such as analyzing the laws and regulations pertinent to copyright protection, pinpointing legal gaps and obstacles faced by these rights, assessing the efficacy of existing legislation, and comparing international laws that govern the safeguarding of digital works in today's digital era. Utilizing a descriptive-analytical methodology, the study aims to clarify and define copyright rights in the digital environment while evaluating how the legal system and technological mechanisms contribute to their protection, focusing on both the distinguishing features of available safeguards and the deficiencies impacting them. The research culminates in significant findings concerning the current legislation's effectiveness and its capability to offer sufficient protection for electronic works, while also identifying various gaps and challenges that require attention. Ultimately, the study presents a series of recommendations aimed at bolstering the protection of copyright holders and refining the legislation related to electronic works.

Keywords Copyright · Electronic works · Digital environment · Legal protection · Legal system

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1 Introduction

The Ottoman Copyright Law, established in 1910, was the initial copyright protection legislation recognized in Arab nations. Until fairly recently, several Arab countries, especially Iraq and Jordan, continued to implement this law. Jordan is regarded as one of the pioneering Arab nations to safeguard copyright through distinct legal measures. In addition to the Ottoman Copyright Law, Jordan incorporated certain copyright protection elements within its civil and penal legislation [1].

Copyright refers to a legal concept that defines the entitlements given to creators concerning their artistic and literary creations. This entitlement consists of two dimensions: moral and economic. The moral aspect is known as the author's right, whereas the economic aspect is termed literary property or exploitation rights. Unlike tangible property, copyright inherently encompasses a range of conflicting traits, and this internal conflict within a singular right fuels the ongoing discussions regarding its essence.

The advancement of modern communication has led to a global reach for literary and artistic creations, thanks to their widespread use around the world. Such creations transcend the borders of their countries of origin, turning nations into collaborators in intellectual production. Consequently, safeguarding these rights has become a collective duty for all nations. The ramifications of intellectual property rights, particularly regarding copyright on the Internet, which is marked by its worldwide scope and the ease with which information can be disseminated and accessed, have contributed to the infringement of copyright in the digital realm. In certain legal frameworks, these infringements are treated as criminal offenses rather than simple violations. This reality underscores the necessity for international regulations concerning copyright protection, supported by various treaties and agreements, alongside numerous national laws designed to uphold these rights within a global context for effective safeguarding.

1.1 Research Problem

The challenge of legally safeguarding digital creations under intellectual property regulations is a significant consequence of the information explosion phenomenon. This issue extends the ongoing debate between advocates and detractors of such rights protection, which has evolved with the transition to electronic publishing. This transition depends on electronic computers, now the primary information source in our contemporary world. The swift advancements in processing, storing, and distributing information via electronic publishing technologies have prompted the need to find methods for protecting digital works as a crucial result of these innovations. To tackle major concerns that prevent authors from fully exercising their rights and to maintain their ability to publish, intellectual property legislation has been enacted. This has emerged as a vital tool for safeguarding the content within information networks

and motivates authors to share and disseminate their original works. Consequently, this study seeks to elucidate the protective measures for intellectual property rights established by international agreements regarding digital works and assess whether existing copyright laws sufficiently protect rights holders amid current technological progress.

1.2 Research Questions

The study aims to answer the following questions:

- What are the legal measures that ensure the protection of copyright in the digital environment?
- What are the procedural and substantive protection measures for copyright?
- How can the legal deposit of works contribute to the protection of copyright?
- What are the regulations governing the process of legal deposit, and which authorities are responsible for it?
- What precautionary measures can be taken to protect copyright from infringements?

1.3 Study Objectives

The current study aims to:

- Analyze the legal framework that protects copyright and digital works.
- Identify the legal gaps and challenges to copyright protection in the digital environment.
- Assess the effectiveness of current legislation and its ability to provide adequate protection for digital works.
- Compare international laws regarding copyright protection and digital works.
- Provide legal recommendations to increase protection for copyright owners and improve legislation on digital works.

1.4 Study Methodology

A descriptive-analytical methodology will be utilized by the researchers to clarify and emphasize copyright within the digital landscape, along with the protective measures that have been put in place. This approach will evaluate how the legal framework and technological tools contribute to safeguarding these rights in the digital realm by analyzing the unique characteristics of the protection as well as the deficiencies that impact it.

2 Copyright in the Digital Environment and Its Legal Protection

The aim of offering legal safeguards for intellectual creations is to foster creativity and intellectual output, guarantee that creators gain from their endeavors, and inspire them to generate additional works. This legal protection employs various methods to deter copyright infringement, which vary in nature, application techniques, and processes, highlighting the multitude of infringement types that impact both the moral and economic rights of authors.

Numerous laws create mechanisms to safeguard copyright, encompassing both procedural and substantive protection strategies. The legal deposit system for works exemplifies procedural protection measures, providing evidence of an author's ownership of their created work by adhering to particular procedures and conditions set forth by law. Moreover, a range of precautionary measures is designed to avert infringement and lessen any resulting damages.

Substantive protection measures include [2]:

- **Civil Protection**: This aims to restore the situation to its original state if possible or to compensate the author for material or moral damage.
- **Criminal Protection**: This targets criminal penalties for those who infringe on copyright rights.

3 Scope of Procedural Protection for Copyright

One of the most efficient approaches to tackle copyright infringements is procedural protection, thanks to its straightforwardness and quick execution. The main objective is to protect rights and resolve any possible violations to uphold their integrity prior to any court disputes. Serious repercussions for copyright arise from infringements on original creations, be they literary, artistic, or scientific, which can result in rights holders being stripped of their rights and compensation for their efforts. Such outcomes may cause a downturn in creative production and promote a tendency toward imitation, highlighting the necessity for legislative action to implement robust protective measures.

Included among these measures are the legal deposit of works and additional precautionary mechanisms that necessitate temporary actions to prevent damage until the issue can be presented in court. The subsequent sections will provide clarification on this: the initial section will focus on the legal deposit of works, while the following section will address precautionary measures.

4 Legal Deposit of Works

Numerous laws outline copyright-related conditions that mandate the submission of works to a specific deposit center or authority designated by the lawmaker. Certain legislations regard this as a fundamental formal requirement necessary for ensuring protection for the work.

The purpose of legal deposit is to gather, protect, and ensure the preservation of intellectual works against loss and deterioration over time. It plays a vital role in the creation and distribution of national bibliographies, while also making the deposited works accessible to the public through various channels such as presentation, notification, or distribution. Furthermore, legal deposit enhances the national library by incorporating all intellectual output published within the nation and supports the exchange of publications with other countries. It serves as an efficient method for substantiating authors' rights, especially moral rights. In instances where disputes arise regarding the authorship of an idea, the copies stored with the appropriate authorities can be referenced to establish the publication date of each claim [2].

The value of the deposit requirement varies among different legislations. Some laws impose penalties for failing to comply, which may include denial of protection, reduced protection, or even monetary fines—an aspect that some scholars find objectionable and unusual. It is essential that protection is guaranteed regardless of whether a deposit has been made; the deposit should serve solely as proof rather than a prerequisite for protection. According to Article 5 of the Berne Convention, protection arises from the mere existence of a work that demonstrates intellectual creativity: "The enjoyment and exercise of these rights shall not be subject to any formalities. Such enjoyment and exercise shall be independent of the existence of protection in the country of origin of the work. Consequently, the scope of protection and the means of redress available to the author for the protection of their rights are governed by the legislation of the country where protection is sought, irrespective of the provisions of this Convention" [3]. Therefore, creation itself establishes protection, which does not rely on deposit; the deposit functions merely as a method for preserving and tracking the work, not as a condition for protection [4].

Legal deposit refers to the requirement for rights holders—be they authors, publishers, printers, or in certain cases, distributors—to submit one or more copies of their published works to an official authority or a legally designated national or private library [2, 5]. A key aspect of legal deposit is that it does not serve as a condition for the protection of the work; thus, neglecting to make a deposit does not undermine the rights of the author as outlined by law, although it may lead to the depositor facing liability for failing to comply. While most relevant laws mandate some form of legal deposit, the absence of such a deposit does not impact the author's rights nor does it hinder their ability to substantiate those rights through alternative forms of evidence [6].

Multiple laws tackle the topic of legal deposit and its stipulations in their copyright frameworks. The Egyptian Intellectual Property Law, Algerian Copyright Law, Iraqi Copyright Law, and Jordanian Copyright Law all contain elements related to legal

deposit. Specifically, Article 2 of the Jordanian Copyright Law No. 22 of 1992, along with its amendments, describes deposit as: "Submission of the original copy of the work to the center and assigning it a deposit number according to the provisions of this law" [7].

The obligation of legal deposit is enforced by the Algerian legislator for anyone producing intellectual or artistic works intended for the public, necessitating that authors submit free copies to designated institutions. It is made clear by Algerian legislation that the purpose of legal deposit is preservation and does not infringe upon the rights of authors or their deposited creations. With the advent of modern technology, a new method of deposit has emerged, allowing works to be submitted electronically to the website of the deposit authority, which features an archival server for storage and offers immediate acknowledgment of receipt.

Key regulations regarding the legal deposit process are detailed in the Algerian Order No. 96–16, which specifies the types of works that must be deposited, the individuals required to comply, and the number of copies mandated, depending on the nature of the work and the institution where the deposit is made [8].

Legal deposit encompasses only those works that are produced in multiple copies through printing, copying, or various reproduction techniques, enabling public access to them, whether at no cost or for a fee, and regardless of whether they are sold, rented, or distributed in other ways. However, it does not include works that appear in newspapers and periodicals unless they are published independently.

According to Article 57 of the Jordanian Copyright Law No. 22 of 1992, the Legal Deposit System No. 4 of 1994 outlines the types of works that must be deposited legally, which encompass photographic images, maps, posters, illustrative images, and various other creations. However, it does not apply to commercial advertisements, annual reports, price lists, postcards, invitations, certificates, patents, and election materials, among others [9].

The quantity of copies needed for deposit differs depending on the specific work and applicable law, with requirements spanning from one to five copies. For example, in 2006, French legislation decreased the number of copies mandated for book deposit to two for publishers and one for printers, down from four.

The laws differ in identifying the authority tasked with receiving deposited copies. For instance, the National Library and Documents House is mentioned in Iraqi law, while Jordanian law points to the National Library. In Bahrain, the Copyright Protection Office is referenced, and Sudanese law designates the Registrar's Office [9]. According to Algerian Order No. 96–16, the National Library of Algeria and the Algerian Cinema Center are recognized as qualified institutions, with the potential to designate additional specialized institutions based on the objectives and conditions outlined in the order [6].

Depositors are required to provide the necessary number of copies to the appropriate authority or authorized administrative entity based on the work's type and nature, in accordance with the library's regulations. In the case of translated works, it is mandatory for both the translator and the publisher to deposit copies [1].

5 Provisional Measures

Provisional measures serve as a swift and straightforward approach to tackling infringements of authors' rights. These measures, made available by the Jordanian legislator for authors to utilize, aim to stop the publication of the work and prevent any exploitation by the infringer. This is accomplished through the seizure of the work, the materials involved in its reproduction, and the profits generated from its unauthorized use [10].

Provisional measures are actions taken to respond to violations that have already taken place, focusing on evaluating the damage to implement necessary steps for its mitigation and management. These actions are characterized as temporary and are generally managed by summary courts, as their necessity ends once the substantive court starts to exercise its protective authority. When a judge issues a provisional order, the evaluation is based on a simple presumption of the evident circumstances, providing protection to those who are perceived to initially possess the right to request such measures [11].

The rise of technological innovations has influenced every facet of life and given rise to new types of violations of authors' rights that were previously unheard of, resulting in a greater reliance on provisional or temporary measures. This situation is particularly pronounced as traditional protective strategies have become less effective for authors or victims seeking to halt these illicit activities, largely due to the intangible characteristics of these offenses and the capacity to remotely eliminate evidence.

According to Article 144, paragraph 1, of Algerian Order 03–05 concerning copyright and neighboring rights, it is stated that "The damaged rights holder may request that the judicial authority take measures to prevent imminent harm to their rights or to stop the observed harm and obtain compensation for the damages incurred." This clause empowers judicial authorities to implement urgent provisional measures to safeguard the infringed rights, as standard legal procedures may be inadequate due to the time needed to reach a judgment on the issue, which the author may not possess.

According to Jordanian law, the provisional seizure requested by the author is intended to halt the publication of the infringing material and to place it in the custody of the court through confiscation. This action aims to prevent additional violations of the protected work and to stop the infringer from distributing or selling the pirated copies to the public. Such unauthorized activities can lead to both material and moral harm to the author [12].

A primary goal of the author's seizure, conducted as a temporary measure, is to stop the distribution of the pirated work and halt its publication, thereby preventing any infringement on the author's rights from the moment of seizure. This action also seeks to protect the work from potential damage, as the pirated material in the infringer's possession could suffer deterioration due to extended legal battles or might be passed on to others, resulting in harm through usage. Furthermore, it serves to restrict the infringer from disposing of the pirated work while also providing physical evidence of the infringement to substantiate the violation of the author's

moral rights. Additionally, if the court decides on compensation for the harm inflicted upon the author, it includes measures against the pirated work and the tools involved in its creation. This entails executing against these items, selling them, and using the proceeds to recover the amount of damages incurred. Article 47/A of the Jordanian Copyright Law outlines this process, empowering the court to seize works and ensure compensation for the author.

The aim of a seizure as a temporary measure is to prevent damage arising from the violation of the author's rights, with the methods of prevention differing based on the nature of the work, until substantive legal actions are pursued. This may involve a directive from the appropriate court mandating the infringer to stop the infringement if it has been proven to have occurred or is likely to occur, or to avert its occurrence by stopping the reproduction, publication, display, or distribution of the work.

The legislator guaranteed that provisional protection measures are available in different forms tailored to the specific nature of the infringed work and the type of infringement that has occurred. According to Article 147 of Order 03–05, it is stated that: "Upon request from the rights holder or their representative, the president of the appropriate judicial authority may order the following precautionary measures":

- Stopping any ongoing production processes aimed at illegally reproducing a protected work or performance or placing unauthorized copies on the market, in violation of copyright and related rights.
- Confiscation, even outside normal business hours, of counterfeit materials and proceeds from the illegal use of works or performances [13].
- Confiscation of equipment used mainly for the production of counterfeit materials. The president of the competent judicial authority may also order the establishment of security by the plaintiff.

Prior to making a decision to halt the infringement on the work or any of its components, the judge is required to evaluate all relevant circumstances, the gravity of the request, and whether it rests on factual and reasonable grounds. This necessity arises from the potential harm such an action could inflict on the defendant by obstructing the publication of the work. Therefore, the judge's discretionary authority demands careful thought and caution, ensuring that the order is founded on reasonable and factual bases.

Measures of this nature apply to works that are publicly accessible through publication, as the methods of infringement differ based on how the work is distributed. This distribution can occur through publication, public performance, or electronic broadcasting via the Internet, which serves as a means for disseminating digital works. The Jordanian legislator has made it clear that seizing copies of counterfeit works, along with the materials and tools employed for unauthorized reproduction, is permissible. Additionally, the court may order the confiscation of copies of the work or any images derived from it, as well as the materials utilized in its creation and the revenues generated from illegal exploitation. This is outlined in Article 47(c) of the Jordanian Copyright Law: "The court may rule to confiscate copies of the work or images taken from it, and the materials used in its production and sale, as far as necessary to compensate the author for the damage caused, instead of destroying those

copies and images or altering their features or destroying those materials" [12, 14]. Consequently, the seizure extends beyond the original creation to encompass reproductions and images, implying that everything generated by others from the original work or its copies—including books, magazines, newspapers, models, sculptures, films, musical recordings, and drawings—is included. However, an author or their descendants cannot demand the seizure of a work if the author has published solely one copy for personal use.

In terms of architectural content, it is prohibited to confiscate works associated with structures, including any carvings, drawings, decorations, and innovative geometric forms integrated into buildings, as such actions would inflict considerable damage on the infringer and contradict public interest considerations. Furthermore, the unauthorized application of designs and drawings on buildings enhances their monetary worth and imposes substantial costs on their owners, representing a form of national wealth that contributes to urban development. The architectural creator, whose designs and drawings have been unlawfully used, can solely pursue compensation for this infringement to safeguard their rights, as articulated in Article 47 of the Jordanian Copyright Law: "In no case shall buildings and what appears on them or in them from carvings, drawings, decorations, and geometric forms be subject to seizure… for the purpose of protecting the rights of the architectural author whose designs have been used for construction and whose drawings have been used illegally, provided this does not affect their right to fair compensation for such infringement" [12, 15]. While the seizure of architectural works is not permitted to uphold the rights of the architectural author, it is allowable if the author has personally executed the works and the agreed payment has not been fulfilled by the owners; in those instances, any portion may be confiscated and sold to settle the debt [16].

In the context of architectural designs found in brochures and books, seizure is allowed since these are classified as manuscripts or maps and do not qualify as architectural works, which pertain to tangible representations seen on buildings, including geometric forms and decorative elements, rather than what is printed in publications [2, 17]. Seizure extends beyond the original creation to encompass copies and images of the work as well. This includes any reproductions or visuals derived from the original through unauthorized methods such as printing, photographing, recording, drawing, or similar techniques. Nevertheless, an author or their heirs cannot demand the seizure of a work that the author has published for personal use [18].

The Internet presents challenges related to infringements that can be hard to identify and therefore prevent, primarily due to its global reach, which complicates efforts by courts or emergency judges to halt such violations in certain situations. This issue stems from the difficulty in regulating or controlling unregistered websites and pages. Nevertheless, in instances where infringement is imminent, similar to traditional works, this also applies to digital works disseminated online. The nature of the network poses a constant threat to published materials. Consequently, infringements are perpetually regarded as imminent [19], highlighting the need for innovative strategies to avert such violations that could impact digital works amid the expanding landscape of digital information exchange on the Internet. A crucial method employed is encryption, which utilizes a sophisticated mathematical algorithm enabling someone

with a secret key to convert readable text into an unreadable format and back again. This technique relies on the secret key to decode and revert the text to its original form. Another approach, referred to as electronic watermarking, seeks to identify unauthorized reproductions by embedding a subtle mark on the image or page that requires protection. This identifier indicates the violation and assists in tracking the origin of the unauthorized reproduction and its unlawful possessor [20].

Legislators from both Algeria and Jordan have designated the appropriate judicial authority responsible for such actions. Should the author or their heirs decide to seek an injunction from the court, they are required to provide all necessary supporting documents. The initial request must take the form of a lawsuit, incorporating the components typical of a standard lawsuit petition. Additionally, it should offer a thorough and detailed account of the work in question, clarifying whether it is a book, audiovisual piece, database, computer program, painting, or another type of protected work, while differentiating it from others. For instance, if the work is identified as a computer program, the description must outline its type and features, given the diverse and intricate nature of computer programs. In general, a comprehensive description of the work is essential for its clear identification and definition [21].

The legislator in Jordan has made it clear that only the copyright owner or their heirs or successors are eligible to submit a request for precautionary protection measures to the appropriate court. This requirement exists because moral rights are intrinsically tied to the author's identity and can only be exercised by the author or, in certain instances after the author's passing, by their heirs. Nonetheless, multiple claimants may be involved in this request, particularly in situations where a joint work includes several contributors, regardless of whether their shares can be divided.

Furthermore, a natural or legal entity may possess the right to seek precautionary measures through the appropriate court regarding the initial dispute in order to safeguard intellectual property rights. Consequently, if there is a genuine infringement on the rights of the author (or their heirs) a formal written application must be filed with the relevant court to implement the protective measures outlined by law. This application must contain a comprehensive description of the work, performance, recording, or program that has been infringed. Additionally, it should be supported by an adequate financial guarantee to avert misuse and to ensure compensation for any possible damage to the defendant, should the claimant's case prove to be unjustified [22].

This petition deviates from the standard procedures for initiating lawsuits, which typically involve case registration and hearing scheduling. Instead, it is founded on the request of the involved parties and a directive from the appropriate court. It may be submitted at any stage (before, during, or after the lawsuit) to establish the author's rights regarding the infringement of their work. The opposing party's presence is not necessary, as the purpose of this order is to catch the opponent off guard with a precautionary seizure before they can conceal their assets.

Should the emergency judge in the primary court determine that the applicant is the legitimate owner whose rights have been violated or are at risk of violation, they are required to issue an order for a comprehensive inventory of the tools and equipment involved in the commission of the offense. In instances where a website

suffers an attack resulting in alterations or modifications to the published content that harm the author's reputation and standing, or when there is unauthorized interaction such as the addition of audio, images, or specific formats to the online work against the author's wishes, or linking the work to pages with inappropriate language or imagery, or placing the work in a political context that contradicts the author's views, the author or their heirs may petition the court to halt the copying and distribution of the program or database. This would be followed by additional actions, including the seizure of the works and initiating a primary lawsuit to ascertain penalties and compensation [23].

Considering the aforementioned precautionary measures, it becomes evident that the procedures designed to safeguard the author's rights are fairly straightforward to execute in both traditional publishing and the electronic distribution of digital materials on disks and CDs. The challenge arises, however, when attempting to enforce these measures on works disseminated via the Internet, as they are susceptible to numerous forms of infringement.

6 Conclusion

Safeguarding authors' rights in the digital realm poses a multifaceted challenge that necessitates a unified approach combining legal and technological strategies. This study has illustrated that while current legislation is significant, it demands ongoing refinement to keep up with the swift changes in the digital landscape and to effectively protect authors' rights. Analyzing the existing laws and mechanisms has revealed critical gaps that require urgent attention to guarantee thorough and complete protection. We trust that this study has offered valuable insights to aid policymakers and stakeholders in the domain of intellectual property rights in strengthening the legal and technological framework to ensure the safeguarding of authors' rights in the digital era.

6.1 Results

The study has concluded the following results:

- The legal methods for safeguarding authors' rights encompass both procedural and substantive protections, creating a thorough framework for deterrence and security.
- The legal deposit of publications serves as a valuable method for safeguarding and asserting rights, although its implementation and stipulations differ across various jurisdictions.
- Temporary measures are crucial instruments for tackling infringements of authors' rights because of their efficiency and ease of implementation.

- Laws differ regarding the terms and worth of legal deposits, with some asserting that protection must be ensured at all times, irrespective of the deposit made.
- Authors are afforded legal protection through a combination of criminal penalties and civil actions designed to remedy damages and provide compensation.

6.2 Recommendations

This study recommends the following:

- Raising the awareness of creators and authors about the importance of protecting their rights and using available legal procedures.
- Harmonizing copyright and legal deposit legislation to make it more comprehensive and compatible between countries.
- Developing and improving provisional measures to make them more effective in combating digital copyright infringements.
- Encouraging the use of modern technologies in the legal deposit process, such as electronic signatures and online deposits.
- Strengthening criminal and administrative penalties for copyright infringers to ensure better protection of intellectual property rights.

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Technology Transfer Contracts: From Definition to Legal Nature



Yasar Alhiniti and Ali Awda Allah Mohammed Al-Khazaleh

Abstract The objective of this research is to examine the legal nature of contracts pertaining to technology transfer and conduct a comparative analysis of the relevant legislation. Employing a descriptive-analytical approach, the study gathered information from diverse legal sources, including domestic and international laws as well as scholarly studies. It entailed scrutinizing legal texts and scholarly viewpoints to ascertain the legal character of technology transfer contracts. To conduct analysis of legislations and examine judicial and arbitral decisions concerning these contracts, the comparative method was employed. The findings of the study revealed notable disparities in the legal treatment of technology transfer contracts. Indeed, many legislations exhibit greater specificity and precision, thereby bolstering the protection of the parties involved, whereas the legal framework in some countries encounter challenges in providing an equivalent level of protection and regulation. Consequently, the study recommended the harmonization of technology transfer legislation to foster legal integration that facilitates and regulates such processes. Furthermore, it proposed the development of more comprehensive and detailed regulations and legislation to fortify legal safeguards for the weaker parties in technology transfer contracts.

Keywords Technology transfer contracts · Legal nature · National legislation · Comparative legislation · Legal protection · Contract regulation · International cooperation

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1 Introduction

The term "technology" emerged in the mid-twentieth century and is characterized by its ambiguous and imprecise nature. It has become a significant focus for governments, both nationally and internationally, in developing countries, as it serves as a source of economic and military power. Scholars and researchers have taken a keen interest in technology, particularly in relation to technology transfer contracts. Due to its novelty and lack of clarity, there are multiple definitions of technology. One definition describes it as the knowledge and scientific methods needed to transform production elements into products [1]. From a legal standpoint, technology is defined as a collection of information on how to apply a scientific theory or invention, commonly referred to as Know-How [2].

Given the immense significance of technology transfer agreements on a global scale, it is vital to recognize their relevance to both developed and developing nations. These contracts hold immense value, particularly for the latter, and are considered to be among the most critical international agreements. Going beyond mere trade, technology transfer contracts have far-reaching implications for economic, industrial, production, and service-related aspects. The objectives pursued by both the exporter and the importer determine the extent to which these contracts impact various facets of society.

To ensure the regulation and preservation of the contracting parties' interests and national economies, certain countries have implemented legislative frameworks for technology transfer. Egypt, Mexico, India, and Brazil are examples of countries that have established such frameworks. Conversely, there are countries like Jordan that have chosen not to regulate technology transfer extensively, with only a few provisions mentioned in their laws. Specific aspects of technology transfer are addressed in Jordan's Unfair Competition and Trade Secrets Law, while general rules pertaining to these contracts are outlined in the Jordanian Civil Code.

The focal point for legal professionals involved in technology transfer lies in the legal aspects of the transfer itself, including the regulations governing the process and the legal obligations imposed on both the exporter and the importer. The legislator plays a pivotal role in organizing the contract that facilitates the transfer of technology [3].

1.1 Study Objectives

This study aims to achieve the following objectives:

- To analyze the legal characterization of technology transfer contracts.
- To examine the impact of national sovereignty on the characterization of contracts.
- To evaluate the protection of the weaker party in contracts.
- To provide recommendations for enhancing and harmonizing legal frameworks related to technology transfer contracts at both international and local levels.

1.2 Methodology

To conduct this study, a descriptive-analytical methodology was employed, which involved gathering information from various legal sources such as national and international legislation, as well as doctrinal studies. In addition, legal texts and doctrinal opinions were carefully examined to ascertain the legal nature of technology transfer contracts and to compare different interpretations of these contracts. Furthermore, a comparative approach was taken to assess how technology transfer contracts are handled in Egypt, Jordan, and Iraq, by examining their respective national legislations, judicial rulings, and arbitration decisions. To ensure a thorough analysis, data were collected from primary and secondary legal sources, including legislative texts, judicial rulings, arbitration decisions, and academic studies.

2 Concept of Technology Transfer Contracts

The allure of technology is undeniable for all nations, particularly those in the process of development, as it plays a pivotal role in attaining economic growth objectives. Technology has evolved from being a mere objective to becoming a tool for achieving holistic progress. Advanced technology offers solutions to numerous challenges encountered by developing countries, including bridging the technological and scientific divide that separates them from more developed nations. Moreover, the transfer of technology and the establishment of industrial ventures bolster the economies of these nations, effectively tackling one of the primary predicaments faced by developing countries: unemployment, which continues to be a pressing issue for many nations in the developing world.

The concept of technology transfer is not rigidly defined, as it can be interpreted differently depending on one's viewpoint. For example, when considering the confidentiality and distribution of technology, there are both proprietary and public technologies. The method of transfer can also be categorized as either horizontal or vertical, and the level of transfer can be classified as national or international. Furthermore, technology can be deemed either appropriate or inappropriate [4].

The significance of technology transfer agreements is closely tied to the objectives that drive the decision to enter into such contracts. Certain nations seek to foster and enhance their scientific research endeavors, as well as establish cutting-edge research facilities, by means of technology transfer. Their ultimate aim is to establish a foothold in the global technology market and effectively compete with the products and services they provide.

The contract acts as a mechanism to ensure a fair distribution of rights and responsibilities between both parties, serving as the legal tool to accomplish the objectives that nations pursue through the transfer of technology.

3 Technology Transfer Contracts and Their Legal Nature

The primary means of facilitating trade is through the use of contracts, which serve as a manifestation of the parties' mutual agreement. Not only do contracts establish legally binding obligations between the parties involved, but they also extend their influence to third parties. In the realm of technology transfer, contracts play a crucial role in facilitating the exchange of technology between developed and developing nations. This process is carried out through a contractual relationship between the exporter and the importer [5].

3.1 Definition of Technology Transfer Contract

Legal scholars and legislation offer differing definitions of technology transfer contracts, lacking a universally applicable comprehensive definition [6]. This discrepancy may stem from the ambiguous nature of the term "technology" and the relatively recent emergence of this contract type, which encompasses intangible aspects not found in traditional contracts.

In terms of legislation, there is a lack of a dedicated legal framework in Jordanian laws concerning technology transfer contracts. As a result, there is no specific definition provided for this concept. It is important to note that it is not the responsibility of the legislator to provide definitions; instead, legal scholars are tasked with offering definitions for any given term.

In Egypt, the definition of technology transfer contracts has been established by the legislator in the form of legal texts, particularly in the new Egyptian Commercial Law No. (17) of 1999. According to this law, a technology transfer contract is an agreement where the technology provider agrees to transfer technical information to the technology importer in exchange. This information is intended for the specific purpose of utilizing a particular technical method in the production or development of a specific product, as well as for the installation or operation of machinery or devices, or for the provision of services. It is important to note that technology transfer goes beyond the mere sale, purchase, leasing, or renting of goods, or the sale of trademarks or trade names, or the licensing for their use, unless these activities are part of or related to a technology contract. This definition provides clarity and specificity to the concept of technology transfer in Egypt [7].

Based on the preceding text, it is evident that a technology transfer contract involves an arrangement whereby the provider agrees to impart technical expertise to the importer for the purpose of producing goods and services. It is important to note that the exchange or acquisition of goods and services, as well as the leasing or renting of trademarks and trade names, or their licensing, does not qualify as technology transfer unless it is explicitly included in a technology transfer contract or a separate contract connected to it [8].

Article (78) of the Palestinian Draft Commercial Law No. (2) of 2014 provides a comprehensive definition of a technology transfer contract. According to this article, such a contract involves the transfer of advanced information from the provider to the importer in exchange for compensation. This information is intended to be used for a specific technical purpose, such as the production or development of a particular product, the installation or operation of machinery or devices, or the provision of services. It is important to note that modern knowledge transfer goes beyond simple transactions involving the sale, purchase, lease, or rental of goods, as well as the sale of trademarks or trade names. These activities only fall under the scope of a technology transfer contract if they are directly connected to or inseparable from the transfer of technology itself [9].

The definition provided by the Palestinian legislator closely resembles that of the Egyptian legislator, with a slight variation in the use of terminology. Instead of using the term "technology," the Palestinian legislator opts for "modern knowledge." This choice is deliberate, as "modern knowledge" encompasses a broader range and is more inclusive than technology alone. It encompasses continuous education, embracing innovations and inventions, and preparing individuals to enhance their capabilities in receiving and interacting with information. This is crucial for fostering further innovation, creativity, and engagement with the revolution in information and communication technology, as well as scientific research [10]. By emphasizing the distinction between technology and modern knowledge, the definition highlights that the latter encompasses not only knowledge itself but also innovation and the preparation of the workforce to comprehend and develop research findings. On the other hand, technology is defined as a collection of information relating to an innovative method for applying a scientific theory or invention [11]. The researcher asserts that the use of "modern knowledge" in Article 78 by the Palestinian legislator is more precise and comprehensive compared to the term "technology" employed by the Egyptian legislator in the Egyptian Commercial Law.

In regards to legislation in Jordan, there is currently no specific legal framework in place for technology transfer contracts and the disputes that may arise from them. The absence of regulation in national legislation is not due to oversight or deficiency on the part of the Jordanian legislator, but rather a result of limited resources and capabilities in the country. The prioritization of economic openness, which is deemed more important than creating legislation for technology transfer contracts, also plays a role. Additionally, the potential risks associated with establishing a law to regulate these contracts are taken into consideration. Investors and technology exporters, in order to safeguard their interests, typically review the laws and regulations of the country they are entering into a contract with. This approach, however, does not align with Jordan's economic policy, which focuses on attracting foreign investments through incentives and exemptions. The legislative focus has primarily been on creating a legal framework to protect intellectual property rights, with technology transfer contracts briefly mentioned in Article 9 of the Unfair Competition and Trade Secrets Law No. 15 of 2000.

Within the "International Technology Transfer Code" of the International Code of Conduct, a highly regarded international entity in the realm of technology, the

definition of technology transfer can be found in Sect. 2.1 in Chap. 1. This definition states that technology transfer involves the transmission of systematic knowledge for the purpose of product creation, practical application, or expertise provision. It explicitly excludes transactions that solely involve the sale or lease of goods. However, this definition has not been without its critics. Some argue that technology transfer should focus on the transfer of systematic knowledge itself, rather than the act of transferring the knowledge. Furthermore, it fails to distinguish between the transfer of knowledge and the recipient's ability to effectively utilize it. In this definition, technology is treated as a physical commodity, with the provider's responsibility ending once the technology is delivered to the importer. There is no commitment to assist the importer in assimilating the knowledge and achieving the desired outcome.

Various definitions of technology transfer contracts have been put forth in legal theory. One such definition states that these contracts involve an agreement where the provider of technology agrees to transfer technical information to the recipient in exchange for compensation. This information is intended for use in a specific technical process, such as the production or development of a particular product, the installation or operation of machinery or devices, or the provision of services [12].

One alternative interpretation is as follows: "A legally binding agreement where one party (referred to as the provider) commits to transferring technical knowledge to another party (known as the recipient). This knowledge is characterized by its confidential and innovative nature, and is intended to be exchanged and utilized for the specific purpose outlined in the contract. In return, the recipient agrees to provide compensation as agreed upon. This contract can exist independently or as part of a larger series of interconnected agreements" [13].

A technology transfer contract is commonly understood as an arrangement between two parties, namely the provider and the recipient, wherein the provider agrees to transfer their owned or possessed technology to the recipient in exchange for a predetermined fee [14]. In this context, the researcher defines a technology transfer contract as a mutually beneficial agreement between a provider and an importer. The provider receives compensation for sharing their knowledge, expertise, equipment, and any other resources deemed valuable for production, scientific research, or development, as outlined in the terms of the contract.

3.2 Legal Nature of Technology Transfer Contracts

Once the legislative and doctrinal aspects of technology transfer contracts have been elucidated, the focus shifts to the legal characterization of these contracts. There is an ongoing doctrinal debate surrounding the nature and classification of these contracts, specifically in terms of assigning them to a particular legal framework that defines their nature, the rights and obligations they entail, the governing law, and the applicable judicial system for resolving disputes [15].

In the realm of international transactions, technology transfer contracts are akin to other contractual agreements that arise from the mutual consent of two parties with

the intention of producing legal consequences. However, they possess a unique characteristic in comparison to other contracts which is the differing legal positions of the parties involved. Some perceive these contracts as international agreements, thereby subject to the principles of public international law [16]. In certain circumstances, they have been treated as administrative contracts, thus being subject to administrative law. In certain jurisdictions, technology transfer contracts are governed by private law, as exemplified in Jordanian legislation. Additionally, due to the widespread nature of technology transfer contracts on an international scale, coupled with their competitive and monopolistic nature, exporting countries often hold superior economic and financial positions in comparison to developing nations. This advantageous situation grants them the ability to draft contracts and establish conditions, leading some to classify technology transfer contracts as contracts of adhesion [17].

In order to provide further clarity, it is necessary to outline the viewpoints and rationales behind each approach mentioned earlier in regards to the classification of technology transfer contracts. The perspective that perceives technology transfer contracts as international agreements asserts that these contracts should be subject to public international law. Supporters of this perspective prioritize the international nature of these contracts in order to safeguard the interests of foreign companies that enter into agreements with countries. By treating any disputes between a foreign company and the contracting state as international disputes, the position of the company is fortified and international accountability is established [18].

Advocates of this viewpoint additionally advocate for the exemption of technology transfer contracts from the purview of national legislation in the contracting state. Their rationale is that the state, being a participant in the contract, would possess a more advantageous position in comparison to the company or individual involved. By applying international law, the weaker party is afforded protection. Conversely, if the law of the contracting state takes precedence, it has the potential to unilaterally modify or terminate the contract, thereby infringing upon the rights of the contracting companies [19].

There has been scrutiny regarding the classification of technology transfer contracts as international agreements. Some argue that international agreements strictly apply to agreements between entities recognized under international law, whereas technology transfer contracts involve a state as the recipient and a party governed by domestic law, be it an individual or a company. Consequently, technology transfer contracts are not regarded as international agreements because one side of the contract lacks sovereignty [20].

The validity of these criticisms has been confirmed by considering the fact that technology transfer contracts do not fall under the purview of public international law and are not considered international agreements. This viewpoint has been supported by international rulings issued by international courts or arbitration. For example, in a landmark ruling in 1952 concerning the nationalization of the Anglo-Iranian Oil Company by Iran, the International Court of Justice declared its lack of jurisdiction over the UK's request to invalidate the Iranian nationalization law, which was made on May 26, 1951. The court's reasoning was based on the fact that the concession agreement signed in 1933 between Iran and the British company did not qualify

as an international agreement, as there was no contractual relationship between the Iranian government and the British government. Instead, it was merely a concession agreement between the Iranian government and a foreign company, with the British government not being a party to the contract [21].

According to the researcher, it is not accurate to categorize a technology transfer contract as an international agreement since the parties involved are not exclusively states or governments. In some cases, the exporter could be a company while the importer is a state, or both parties may be companies. Furthermore, even if one of the parties represents a state or government, they may be compelled to accept the terms dictated by the exporter because of their reliance on the technology being transferred. In contrast, international agreements are typically governed by the principle of state sovereignty, which prohibits one state from succumbing to the demands of another [22].

The classification of technology transfer contracts as administrative contracts, thereby aligning them with the principles of administrative law [23], is predicated on the presence of a party possessing sovereign status, a cornerstone of contemporary international law. Sovereignty denotes the absolute and perpetual control exerted by a state over its territory and natural resources. Technology transfer contracts, often referred to as technological development contracts, are categorized as development contracts due to their shared objective of promoting the public interest. Similar to administrative contracts, these agreements involve the participation of the state or one of its public entities, which exercises its authority either directly or indirectly. This criterion serves as a crucial determinant in distinguishing administrative contracts [24].

The nature of technology transfer contracts has been a topic of discussion in international commercial dealings. It has been observed that these contracts cannot be categorized as administrative contracts, as there are certain factors that distinguish them. Interestingly, many countries, including those in the Anglo-American system, do not make a clear distinction between administrative contracts and civil contracts. This lack of distinction leads to legal inconsistencies and instability in commercial transactions. Additionally, the absence of an international administrative court further complicates matters, as there is no designated authority to resolve disputes related to technology transfer contracts [25].

In order to promote economic development and attract investment, many countries offer incentives and exemptions to investors who bring in valuable technology. However, these measures limit the public authority's control and jurisdiction over the entry of such technology into their territories. This contradicts the principles of administrative contracts, where public authority typically holds absolute jurisdiction. As a result, arbitration rulings have rejected the classification of technology transfer contracts as administrative contracts.

Regarding the dispute between Saudi Arabia and the Arabian American Oil Company (Aramco), the arbitration panel determined that the contract should not be categorized as an administrative contract. This decision was based on the fact that Saudi law, which is based on Islamic law, does not acknowledge the concepts of public law and administrative law as they are understood in French law. Instead, the

Aramco concession was deemed an unspecified contract that cannot be classified as a conventional contract [26].

The instability of technology transfer contracts can be attributed to the application of administrative contract rules. Various international legislations grant the contracting administration the unilateral right to terminate the contract in the interest of the public. For example, Jordanian legislation, specifically Article (/102b), allows for contract termination if it is deemed necessary for the public interest. Similarly, Egyptian legislation, as outlined in the Government Contracts Law No. 182 of 2018, states in Article 25 that the administration has the unilateral right to terminate the contract. This creates an environment where foreign contracting parties face instability and lack of protection, resulting in unequal legal positions within the contract. Their only recourse is to seek compensation. Furthermore, this approach restricts technology importation to states and public authorities, limiting the involvement of private individuals and institutions. Consequently, the flow of technology to developing countries, which is a goal these countries strive for, is hindered and diminished [25, 27].

Based on the decisions made in international commercial arbitration, certain scholars categorize technology transfer contracts as private law contracts. These contracts are also seen as adhering to the principle of international freedom of contract, which is derived from the principle of autonomy of will.

In the realm of legal provisions, technology transfer contracts can be categorized as named contracts due to their specific mention and regulation in the law. This can be observed in Egyptian law, where the Egyptian Commercial Law No. 17 of 1999 explicitly outlines a legal framework for technology transfer contracts. On the other hand, Jordanian law does not have any specific regulations for technology transfer contracts, classifying them as unnamed contracts. The differentiation between named and unnamed contracts is based on their legal treatment, with unnamed contracts emerging from a combination of preexisting contractual agreements [28].

The Egyptian legislator has taken a consistent approach in regulating technology transfer contracts, treating them as an integral part of commercial contracts and giving them considerable importance. These contracts are subject to the general rules of Egyptian law, but specific provisions have also been put in place to address contemporary developments [12, 29].

Alternatively, there are those who perceive technology transfer contracts as adhesion contracts. In legal terms, an adhesion contract refers to an agreement where the accepting party is obligated to adhere to predetermined terms established by the offering party, without any opportunity for negotiation or alteration. This type of contract is particularly noteworthy because the adhering party is essentially bound to accept the contract in its entirety, devoid of any ability to engage in discussions or make modifications to its provisions [18, 30].

The legislators in Jordan and Egypt share a common understanding of adhesion contracts. Both Article 104 of the Jordanian Civil Code No. 14 of 1976 and Article 100 of the Egyptian Civil Code of June 16, 1948 stipulate that in adhesion contracts, acceptance is restricted to simply agreeing to pre-established terms set by the party making the offer, without the opportunity for negotiation [31, 32].

It is evident from these definitions that an adhesion contract encompasses two key elements. Firstly, one party establishes the terms of the contract and presents them to the other party. Secondly, the party imposing the terms (known as the adherent) does not permit any negotiation or modification of these terms. Instead, they must be accepted as they are, resulting in either the completion or rejection of the contract. Adhesion contracts are also referred to as "contracts in which the acceptor agrees to predetermined terms established by the offeror, without the opportunity for discussion, regarding a product or service with a legal or practical monopoly or limited competition" [15, 33].

The issue of whether technology transfer contracts can be classified as adhesion contracts is a subject of debate. Supporters of this viewpoint assert that the characteristics of adhesion contracts closely align with the common practice of entering into technology transfer agreements. In such cases, the importing state may find itself with limited alternatives and must make a binary decision of either fully accepting the contract or completely rejecting it [5, 34].

In terms of legality, the exporter of technology, regardless of whether it is a private entity or a state, possesses significant influence due to its exclusive legal control over the technology. This control allows the exporter to exert authority over the importing party, which has limited options due to the monopoly held by technologically advanced states [35, 36]. On the other hand, critics argue that technology transfer contracts should not be classified as adhesion contracts, as previously described. Despite the economic, industrial, and financial power of the technology owner, which creates economic and industrial dependence for developing countries, the sovereign authority of the importing state maintains a balance in the contract, counteracting the exporter's economic, financial, and industrial power. This distinction separates technology transfer contracts from adhesion contracts [37].

The broad technology market and fierce competition among developed nations vying for a greater portion of the technology consumption market during global economic downturns lead the researcher to reject the notion that technology transfer contracts are adhesion contracts. Developing countries have various avenues to obtain technology, and some have implemented legal measures, like Egypt and Iraq, to safeguard against adhesion. Additionally, the limited scope for negotiating specific contract terms further supports the argument that technology transfer contracts should not be classified as adhesion contracts [4, 38].

According to Egyptian Commercial Law No. 17 of 1999, specifically Article 87, disputes arising from technology transfer contracts mentioned in Article 72 of the same law fall under the jurisdiction of Egyptian courts. These disputes can be resolved either through amicable settlement or arbitration conducted within Egypt, in accordance with Egyptian law. It is important to note that regardless of the circumstances, the resolution of the dispute must adhere to Egyptian law, rendering any agreement to the contrary null and void [11, 39].

The researcher highlights that Article 87, which mandates arbitration in Egypt and the application of Egyptian law to disputes, supersedes the principle of party autonomy in selecting the place of arbitration and the applicable law, as outlined in the UNCITRAL Model Law on International Commercial Arbitration. The UNCITRAL

Model Law states in Article 1(20) that "the parties are free to agree on the place of arbitration…" and in Article 1(28) that "the arbitral tribunal shall decide the dispute in accordance with the rules of law chosen by the parties as applicable to the substance of the dispute" [40]. It appears that the Egyptian legislator has deviated from international arbitration law in order to safeguard the interests of the importer in technology transfer agreements, particularly in the case of developing countries, and to protect the national economy. By applying domestic law to contracts involving developed nations, the Egyptian legislator seeks to uphold national sovereignty and independence, rejecting the use of foreign law in dispute resolution, which is a departure from past practices [8, 41].

In line with the researcher's viewpoint, the Iraqi Civil Code, specifically Article 2/167, affirms that "in cases where a contract is entered into through adhesion or includes unfair terms, the court has the authority to alter any provision." This illustrates how importing nations exert their sovereign authority and enforce regulations that work in their favor when dealing with prominent technology corporations that engage in adhesion contracts or include abusive clauses [42].

To summarize, technology transfer contracts possess unique characteristics that differentiate them from other types of contracts. These contracts focus on the subject matter, obligations, and performance criteria necessary for the importer to obtain the transferred technology, as well as the knowledge and expertise associated with it. In return, the exporter receives compensation. Although these contracts may take on different forms and appearances, their fundamental nature remains unchanged.

4 Conclusion

Upon reaching the end of this study, it becomes apparent that a comprehensive examination of diverse legal and legislative viewpoints is necessary in order to ascertain the legal categorization of technology transfer contracts. The analysis reveals that these contracts do not neatly fit into a specific legal framework; their classification as administrative contracts, international agreements, or private contracts is contingent upon the specific context and elements they encompass.

4.1 Findings

The study has led to the following findings:

1. The categorization of technology transfer contracts within the legal framework is subject to considerable diversity. Certain academics perceive them as international agreements, whereas others regard them as administrative contracts or adhesion contracts.

2. When it comes to agreements involving a governing entity, like states or governments, these contracts are commonly referred to as administrative contracts because of the significance of state sovereignty in these arrangements. This is apparent in situations where states seek to safeguard their national interests by enforcing their laws on these specific contracts.
3. Due to the lack of specific legal regulations in certain national legislations, technology transfer contracts are occasionally categorized as either unnamed contracts or adhesion contracts.
4. The legislative measures implemented in countries like Egypt and Iraq indicate a growing inclination towards safeguarding the interests of the more vulnerable party involved in a technology transfer agreement, be it a state or a private entity.

4.2 Recommendations

1. The development of a comprehensive global legal framework for governing technology transfer contracts is necessary to establish clear rights and obligations for all parties involved and minimize discrepancies in legal interpretations across different countries.
2. In order to safeguard the interests of states during technology transfer agreements, it is imperative to strengthen national legislations.
3. To ensure equitable treatment for all parties involved, it is important to promote transparency and fairness in negotiations concerning technology transfer contracts by implementing effective mechanisms for negotiation, mediation, and arbitration.
4. Efforts to enhance international collaboration in technology transfer between developed and developing nations should be intensified.
5. In order to keep up with advancements in technology and its transfer, countries must consistently evaluate and revise their national laws, implementing legislative changes that offer improved protection for domestic parties and facilitate the acquisition of cutting-edge technology.

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The Impact of Organizational Justice on Job Engagement Among Employees



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Abstract The objective of this study was to investigate how various dimensions of organizational justice—namely distributive justice, procedural justice, and interactional justice—affect job engagement dimensions, which include job absorption, job dedication, and job vigor, among employees. This research highlights organizational justice and job engagement as critical variables. Employing a descriptive-analytical approach, the study identified a population of employees, with a target sample consisting of 202 individuals. Out of these, 177 questionnaires were returned and deemed valid for analysis. Appropriate statistical methods were utilized to analyze the data and address the study's inquiries. The findings revealed a statistically significant relationship between the dimensions of organizational justice and those of job engagement. Consequently, the study recommended that effective leadership should be pivotal in fostering organizational justice. Leaders are encouraged to maintain transparency in their decisions and actions while showcasing a firm commitment to justice, as this will likely motivate employees and improve their levels of job engagement.

Keywords Organizational justice · Job engagement · Ministry of Youth Jordan

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1 Introduction

Every organization aims to cultivate an optimal work environment that boosts employee satisfaction, commitment, and engagement. Thus, it is essential for organizations to implement effective and dependable management strategies and techniques to guarantee the ongoing involvement of capable human resources in their operational activities [5]. This requirement stems from the significance of human resources in delivering services that satisfy the various needs and demands of institutions. As a result, organizations emphasize the importance of fostering employee job engagement, since the stability of employees in their positions and their proactive involvement in production and service activities are closely linked to their level of engagement [14]. Job engagement serves not only as a driving force for employees within the organization but also plays a vital role in enhancing their energy and consistently improving their performance, allowing them to reach both personal and organizational objectives.

Organizational justice plays a crucial role in shaping the administrative atmosphere and enhancing overall organizational performance. The way employees perceive justice, or the lack thereof, can significantly influence the workplace environment. When justice is absent, it results in a decline in performance across multiple areas [7]. Thus, organizational justice emerges as a vital factor that profoundly impacts the efficiency of employees' job performance and, in turn, the organization's overall effectiveness. Additionally, it is intricately linked to employees' values and social connections, which directly influence their motivation and level of effort [6].

The importance of organizational justice lies in its ability to influence employee job engagement. This engagement indicates how well individuals can and want to immerse themselves in their work environment and make constructive contributions toward the organization's objectives. By fostering organizational justice, it is anticipated that job engagement levels will rise, subsequently enhancing overall performance and increasing job satisfaction among employees.

1.1 Research Problem and Questions

The increasing focus on job engagement among researchers stems from its vital role in boosting organizational performance, particularly regarding its interplay with other influential factors within the workplace. Studies, such as those conducted by Al-Majali and Hamdan [4], demonstrate that job engagement improves employees' analytical and innovative problem-solving skills, while [20] emphasizes its significant contribution to helping employees recognize the value of their roles, thus enhancing both individual and collective performance. Recognizing human resources as one of the most crucial assets within organizations, it is essential to foster a

supportive and equitable work environment for their ongoing growth and development, highlighting the significance of organizational justice as a key management element, as pointed out by Zaidia [25]. However, despite this interest, a notable research gap exists in assessing the effects of organizational justice on various factors across different industries, as detailed by Obaidat and Abu Zaid [19].

The urgency of addressing the problem presented in this study arises from the critical need to investigate how organizational justice influences job engagement within Jordan's Ministry of Youth. To the researchers' knowledge, no previous studies have examined these variables in this specific context. The researchers considers job engagement to be a key factor in boosting organizational performance while also enhancing employee satisfaction and commitment [2]. The relationship between job engagement and organizational justice plays a vital role in fostering a supportive work environment that elevates both individual and collective performance, as well as enhances the analytical and creative abilities of employees. Nonetheless, there exists a research gap concerning this relationship within the public sector in Jordan. This study seeks to bridge that gap by assessing the impact of organizational justice on job engagement, thereby contributing to the improvement of administrative performance and the attainment of organizational, humanitarian, and community objectives. Consequently, the primary research question is: Does organizational justice, along with its dimensions (distributive justice, procedural justice, and interactional justice), influence job engagement and its dimensions (job absorption, job dedication, and job vigor) among employees of the Ministry of Youth in Jordan?

1.2 Study Model

To achieve the purpose of the study, the researchers developed a study model that illustrates the relationship between the independent variable and the dependent variable, as shown in Fig. 1.

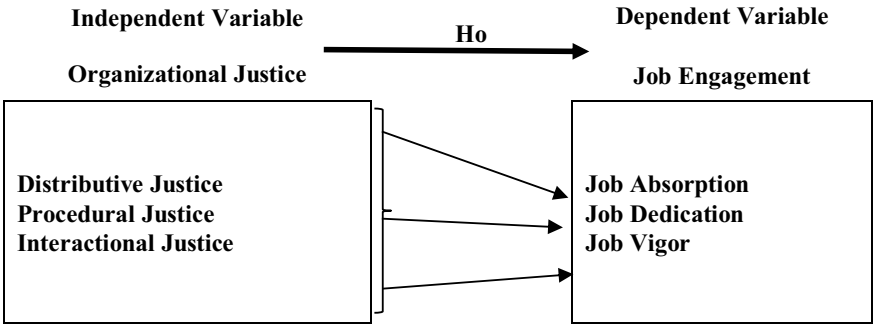


Fig. 1 Study model. *Source* Al-Harthi and Al-Othman [3], Niehoff and Moorman [18], Al-Majali and Hamdan [4], Schaufeli et al. [23]

1.3 Study Hypothesis

- **Main Hypothesis 1 (H0)**: "There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of organizational justice with its combined dimensions (distributive justice, procedural justice, and interactional justice) on job engagement with its combined dimensions (job absorption, job dedication, and job vigor) in the Ministry of Youth, Jordan."

2 Literature Review

2.1 Organizational Justice

Organizational justice encompasses a variety of definitions, all of which typically align with the broader concept of justice. To gain a comprehensive understanding of organizational justice, it is crucial to examine the diverse definitions offered by scholars in this area. According to Zayer and Benabdelhadi [26], it is characterized as a behavioral concept that pertains to self-perceptions of justice regarding compensation, decision-making processes, and interpersonal relationships within the organization, while also serving as a social system that reflects individuals' views on justice in social and economic interactions within the organization. Mahmood et al. [15] described it as the perception of fairness within the organization, which includes the distribution of resources, rewards, opportunities, as well as the procedures and interactions involved in decision-making. Shalaby et al. [24] introduced a concept related to the feeling of fair and equitable treatment within the workplace, highlighting employees' perceptions of their treatment by the organization. The principle of justice plays a vital role in human interactions, as its realization fosters individuals' feelings of fairness and equality across various sectors—be it educational, industrial, or cooperative—thus contributing to a cohesive and stable environment. The implementation of justice within employment sectors is essential, resulting in numerous beneficial outcomes such as increased productivity and quality of output, lower turnover rates, and a subsequent decrease in recruitment and training expenses while channeling expertise toward meeting organizational objectives. To reach the productivity levels of departed employees, organizations must allocate extra time, effort, and resources to recruit, qualify, and train replacements. This approach not only boosts employee morale but also fosters a high degree of job satisfaction [1].

2.2 Dimensions of Organizational Justice

Organizational justice is an extensive managerial concept utilized in various types of organizations at all times. While some research may occasionally view it as a unidimensional idea, investigations into organizational justice, particularly during the early twentieth century, regarded it as a multidimensional framework. For example, Colquitt et al. [11] noted that justice research seldom addresses more than one dimension of justice simultaneously and proposed that incorporating multiple dimensions within individual studies could enhance the explanation of outcome variance. Likewise, Aryee et al. [8] indicated that to fully grasp the social exchange foundation of workplace dynamics and employee behavior, it is essential to examine all three dimensions of organizational justice concurrently. This methodology has remained prevalent in the categorization of organizational justice in later and current research. Numerous studies suggest that organizational justice is comprised of three primary forms. The first is distributive justice, which pertains to how individuals perceive the outcomes of decisions. In contrast, procedural and interactional justice focus on perceptions regarding the processes involved in making and executing these decisions. Procedural justice relates to employees' views on the fairness of the procedures utilized in decision-making, whereas interactional justice concerns perceptions of the fairness in the personal treatment employees receive during the execution of these decisions.

This research employs a multidimensional framework for examining organizational justice, encompassing distributive, procedural, and interactional justice. The researcher contends that a thorough understanding of employees' perceptions and responses to their treatment within the organization necessitates an extensive analysis of outcomes, processes, and the interactions associated with those processes. By categorizing justice into these three dimensions, a clearer understanding emerges regarding the impact of organizational policies and practices on employee behavior and satisfaction. This approach ultimately strengthens the validity and reliability of research findings in uncovering the internal dynamics of organizational justice.

2.3 Concept of Job Engagement

Job engagement signifies the degree of enthusiasm and commitment an employee exhibits towards their role and the organization they are part of. Employees who are engaged dedicate remarkable effort to fulfill the organization's objectives, aiding in its success, advancement, and sustainability. Generally, an engaged employee begins their day with excitement and is motivated by a profound desire to perform at their best, actively engaging and focusing on both small and large details in their work setting [4]. When such behavior is met with management's support, recognition, encouragement, and rewards, the employee showcases loyalty and commitment that benefits the organization. Typically, an engaged employee is more productive and

stands out, giving considerable attention to their tasks and the organization's performance and accomplishments, feeling that their contributions enhance the quality of the organization's output and that they are part of something greater than merely earning a paycheck. Key characteristics of an engaged employee include a strong belief in the significance of their organization, an ongoing desire to make improvements, collaboration and respect for peers and leaders, a positive outlook towards the organization, and a sense of pride and admiration for it. Employees have confidence in the excellence of the organization's products and services, perceive that the culture within the organization allows them to excel, act with selflessness, and aim to be effective team members, often going above and beyond the basic job requirements [12]. According to Bilal et al. [10], job engagement is characterized as a psychological condition that motivates employees and propels them to contribute towards both individual and organizational objectives, significantly influencing employee performance and outcomes at both personal and organizational levels. This engagement is marked by absorption, commitment, enthusiasm, energy, dedication, and passion for work, signifying a psychological state in which employees are genuinely invested in the organization's success and committed to delivering high-quality results that exceed job expectations. It embodies personal fulfillment and a sense of inspiration and validation derived from work, alongside a feeling of belonging within the organization [22].

2.4 Dimensions of Job Engagement

Job engagement encompasses a multifaceted psychological experience characterized by three fundamental elements: vigor, which indicates elevated energy levels and the capacity to work diligently and persistently while embracing challenges; dedication, which denotes the deep involvement of an individual in their work, accompanied by feelings of belonging, inspiration, and pride in their responsibilities; and absorption, which signifies an individual's intense concentration on their tasks, often leading them to lose track of time and struggle to disconnect from work. When examining the facets of job engagement, various dimensions can be utilized that collectively create a holistic psychological state with a significant impact on employee performance. Vigor within the workplace illustrates the enthusiasm and energy an individual invests in their job. Those who experience vitality and vigor in their work are likely to perceive their capability to meet job demands effectively and engage positively with colleagues, showcasing a strong readiness to dedicate time and effort to their tasks [16].

Dedication represents a psychological condition that encompasses both feelings of energy and happiness. This emotional state, known as "positive affect," signifies a robust sense of well-being. When we picture enthusiastic employees, we imagine them being actively engaged rather than merely involved; this aspect seeks to inspire feelings of significance, enthusiasm, and pride in their work, with employees perceiving their roles as both challenging and motivating [16].

Absorption is characterized by researchers as a state of complete immersion and joy in one's work, where time seems to vanish and maintaining focus on tasks becomes challenging [20]. This indicates that when employees experience absorption, they are profoundly engaged in their work, finding it difficult to detach from their responsibilities as time accelerates. According to Loerbroks et al. [13], absorption entails a thorough concentration on work and total involvement in it. Individuals exhibiting absorption demonstrate a strong interest in their tasks, struggling to disengage from their job responsibilities. This suggests that absorption reflects a person's passion for their work and commitment to it, representing a form of self-dedication marked by joyful focus and engagement in work activities.

2.5 Previous Studies

The research conducted by [19] sought to investigate the influence of management by walking around on employees' views regarding organizational justice within the Jordanian Ministry of Education. It examined how different aspects of management by walking around—such as enhancing communication, revealing truths, fostering motivation, promoting development, encouraging creativity, and providing feedback—impact organizational justice. Utilizing a descriptive analytical methodology, the study distributed a questionnaire to 229 employees across various directorates within the Jordanian Ministry of Education. The findings indicated that management by walking around has a positive effect on organizational justice overall. The researchers suggested ongoing training and development for managers and department heads, highlighting the necessity of equipping them with the essential tools to effectively implement walking around and improve organizational justice.

Memon et al. [17] explored how organizational justice influences employee turnover in commercial banks. Their investigation focused on the connection between organizational justice and the rate of employee turnover. Utilizing a descriptive analytical methodology, the researchers distributed a questionnaire to 200 employees from various commercial banking institutions. This questionnaire addressed numerous variables associated with both organizational justice and employee turnover. The primary findings revealed that organizational justice positively affects the reduction of employee turnover, suggesting that a robust system of justice can motivate employees to remain with their organizations rather than pursue external opportunities. Among the recommendations were the enhancement of organizational justice practices within banks to lower turnover rates and boost job stability, alongside the necessity of training and developing leaders and managers to grasp and implement organizational justice principles, thereby fostering a fair and equitable workplace.

The research conducted by Baher and Alkhadher [9] sought to explore the connections among three facets of organizational justice—procedural, interactional, and distributive—and their effects on five aspects of organizational citizenship behavior within government entities in Kuwait. A total of 573 employees from nine various

government ministries in Kuwait participated in the study through the distribution of questionnaires. The results indicated that employees' views on interactional justice positively influence their perceptions of both procedural and distributive justice. Furthermore, the findings demonstrated that interactional justice has an indirect effect on all dimensions of organizational citizenship behavior via employees' perceptions of distributive justice. The study suggested that managers in public organizations should focus on enhancing interactional justice levels, as this can lead to improved perceptions of both distributive and procedural justice, ultimately fostering greater expressions of civic virtue, sportsmanship, altruism, kindness, and overall employee behavior.

Roberts [21] investigated the impact of employee age on job engagement levels, set against a backdrop of growing interest in generational interactions within modern workplaces. The research sought to evaluate the correlation between age and various aspects of job engagement, including vigor, dedication, and absorption. Utilizing a quantitative approach, the study involved 181 participants who completed the Utrecht Work Engagement Scale (UWES), which assesses job engagement along with demographic information. Findings revealed that employees aged over 50 exhibited considerably higher job engagement levels than their younger counterparts, particularly in terms of dedication and absorption. This study underscored the significance of recognizing age's influence on job engagement to enhance human capital management strategies in organizations. HR professionals can leverage these findings to craft employee engagement initiatives that capitalize on the dedication and skills of older workers.

3 Methodology

3.1 Study Population and Sample

The study population was chosen by the researchers to be the Jordanian Ministry of Youth and Sports, which functions as a government service institution. The research question, target population, and employed statistical methods all influence the determination of an appropriate sample size. Consequently, it is essential to select a representative sample size for the study design, as this choice has a direct impact on the accuracy of the results and their generalizability.

In this research, the entire workforce at the Ministry of Youth and Sports center in Jordan constitutes the target population. This implies that every individual in the study population was included as part of the research sample. A comprehensive sampling method is regarded as appropriate for fulfilling the research aims and ensuring accurate and reliable data analysis. Based on information gathered by the researcher, the total number of employees at the Ministry of Youth and Sports center in Jordan stood at 202 in 2024. Following the distribution of questionnaires in both electronic and paper formats, the researcher successfully collected 177 valid responses out

of 202, yielding a response rate of 88%, which is considered significantly high in comparison to similar studies. Although 182 questionnaires were initially retrieved, a thorough review revealed that 5 were invalid for analysis due to issues such as multiple responses, lack of seriousness from participants, or a considerable amount of missing data.

3.2 Reliability of the Study Tool

Table 1 displays the internal consistency coefficients for each study variable, determined through Cronbach's alpha test. The findings indicate that the internal consistency coefficients for the variable dimensions fall between 0.770 and 0.861. Specifically, the coefficient for the independent variable was 0.81, while it was 0.868 for the dependent variable, and 0.833 for the overall questionnaire. Such values are deemed to reflect strong reliability in social and human research.

4 Testing the Hypotheses

In order to tackle the primary research question—what effect does organizational justice, encompassing its dimensions of distributive justice, interactional justice, and procedural justice, have on job engagement, which includes absorption, dedication, and vigor, among employees at the Jordanian Ministry of Youth? The researchers

Table 1 Internal consistency coefficients for each study variable using Cronbach's Alpha test

Sections	Variable	Dimensions	Cronbach's Alpha	Number of items
1–5	Organizational justice	Distributive justice	0.770	5
6–10		Interactional justice	0.702	5
11–15		Procedural justice	0.758	5
1–15		Organizational justice overall	0.81	15
16–20	Job engagement	Absorption	0.770	5
21–25		Dedication	0.806	5
26–30		Vigor	0.861	5
16–30		Job engagement overall	0.868	15
1–30		Overall questionnaire	0.833	30

performed a multiple linear regression analysis to evaluate how the independent variable, organizational justice, influences the dependent variable, job engagement.

4.1 Testing the Main Hypothesis

In this study, the null hypothesis (H0) asserts that there is no statistically significant impact at a significance level ($\alpha \leq 0.05$) of organizational justice—comprised of its dimensions: distributive justice, interactional justice, and procedural justice—on job engagement, which includes absorption, dedication, and vigor, within the Ministry of Youth—Jordan. To evaluate this hypothesis, the researchers conducted a multiple linear regression analysis to forecast changes in the dependent variable due to variations in the dimensions of the independent variable. The researchers also aggregated the dimensions of the dependent variable into a singular measure (job engagement) by computing their arithmetic mean Table 2.

According to the table, the Pearson correlation coefficient (R) between the independent variable's combined dimensions and job engagement, the dependent variable, is 0.713. The coefficient of determination (R2) stands at 0.508, suggesting that the combined aspects of organizational justice—namely distributive, interactional, and procedural—account for 51% of the variance observed in job engagement. The ANOVA analysis reveals a substantial F value of 59.477 alongside a significance level (sig) of 0.000, which is below 0.01. This supports the acceptance of the alternative hypothesis, confirming that the regression is statistically significant and that the dimensions of the independent variable have a notable impact on the dependent variable.

The findings indicate that every aspect of organizational justice—distributive, interactional, and procedural—exerts a positive and significant influence, achieving statistical significance at the ($\alpha \leq 0.05$) threshold. The unstandardized B values demonstrate that distributive justice has a minimal impact (0.108) on job engagement, ranking it as the least influential among the dimensions. Interactional justice also shows a weak effect (0.191) on job engagement, whereas procedural justice presents

Table 2 Results of multiple linear regression analysis for testing the main hypothesis

Varables		Coefficients			Model summery		ANOVA	
Dependent variable	Independent varable	B	T value	Significance t	R	R^2	F value	F significance
Job engagement	Distributive justice	0.124	2.298	0.023	0.713	0.508	59.477	0.000
	Interactional justice	0.187	2.769	0.006				
	Procedural justice	0.325	4.412	0.000				

a moderate effect (0.324) on job engagement. Consequently, the null hypothesis (H0) is dismissed, and the alternative hypothesis (H1) is affirmed, asserting that organizational justice, through its combined dimensions (distributive, interactional, procedural), significantly affects job engagement, which encompasses its dimensions (absorption, dedication, vigor) within the Ministry of Youth—Jordan.

5 Discussion of Results and Recommendations

Research Question: What is the impact of organizational justice with its combined dimensions (distributive justice, procedural justice, and interactional justice) on employee engagement with its dimensions (job absorption, job dedication, and job vitality) among employees of the Ministry of Youth in Jordan?

To tackle the aforementioned question, the researchers introduced the null hypothesis, which asserted: "There is no statistically significant effect at a significance level of ($\alpha \leq 0.05$) of organizational justice, encompassing its combined dimensions (distributive justice, procedural justice, interactional justice), on employee engagement, which includes its combined dimensions (job absorption, job dedication, job vitality) within the Ministry of Youth, Jordan." However, this hypothesis was dismissed following the results of the data analysis, leading to the acceptance of the alternative hypothesis that states, "There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of organizational justice, along with its combined dimensions (distributive justice, procedural justice, interactional justice), on employee engagement, which comprises its combined dimensions (job absorption, job dedication, job vitality) in the Ministry of Youth, Jordan." The statistical analysis that supports the alternative hypothesis underscores the vital role of organizational justice in fostering employee engagement.

5.1 Analysis of Results

1. **Organizational Justice as a Significant Factor**: The findings suggest that enhancing employee engagement is significantly influenced by organizational justice, with its various dimensions—distributive, procedural, and interactional—exerting a substantial effect on job absorption, job dedication, and job vitality. Employees who recognize fairness in distribution, interactions, and procedures experience heightened satisfaction and a stronger commitment to their organization.
2. **Positive Impact of Justice on Engagement**: Positive participation and diminished conflicts within the workplace are fostered by organizational justice, leading to a productive and cohesive environment. This concept is particularly vital in the public sector, especially within the Ministry of Youth, given the

significant role these institutions have in delivering public services and facilitating social development. The effectiveness of these functions is heavily reliant on employee engagement and satisfaction, underscoring the significance of organizational justice not just as an element of job satisfaction, but also as a critical factor in attaining both organizational and national objectives.

3. **Organizational Justice as a Key Element of Engagement**: Enhancing elements of organizational justice, including distributive, procedural, and interactional justice, boosts employees' feelings of involvement in their positions and in the organization overall.

5.2 Recommendations

1. **Enhancing Transparency and Accountability**: It is very important to improve the transparency of public sector organizational procedures (procedural fairness). Administrative procedures should be clear and organized to increase employee confidence in administrative activities, including penalties and rewards. Organizational justice increases employees' sense of justice, which leads to greater commitment and work effort.
2. **Training Managers and Department Heads**: It is recommended to provide continuous training for managers and department heads in the application and promotion of organizational justice principles. This will help them understand the positive impact of equity on various factors that are important to employees. Employees who feel that they are getting the development they need are more likely to perform better and be more motivated.
3. **Facilitating Employee Engagement**: Organizations, including youth departments, should improve opportunities and opportunities for employee participation, especially in decision-making processes that affect them. Providing them with necessary materials and information can promote their participation in work.

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The Impact of Implementing Tax Awareness Policies on Tax Taxpayers' Compliance: An Analytical Study



Mohyedin Hamza, Majed Almarie, Nasri Alwekhyan, Khaled Jbair, and Ahmad Obeid

Abstract The objective of this study is to investigate tax awareness and its influence on enhancing compliance among taxpayers. To fulfill the aims of the research, a questionnaire was developed, comprising two primary sections, drawing from prior studies and the theoretical framework. This questionnaire was then disseminated to the sample, which included all taxpayers of income and sales taxes spanning the industrial, commercial, and service sectors. Various suitable statistical methods were employed to analyze the data collected from the questionnaire using the Statistical Package for the Social Sciences (SPSS). Findings revealed that the independent variables—both individually and collectively—namely the taxpayer's awareness and comprehension of the financial repercussions of breaching tax laws, as well as their understanding of the financial effects on the state's resources due to non-compliance with tax obligations, positively influenced the enhancement of tax compliance among taxpayers. The study concludes with several recommendations, emphasizing the necessity of promoting tax awareness among taxpayers, educating them on the significance of taxes, organizing academic seminars and conferences to elevate awareness regarding tax payments, and prioritizing the development of diverse academic and research initiatives. Furthermore, employing social media platforms (including Facebook, Twitter, and others) to share tax regulations and calculating practices.

Keywords Tax awareness policies · Tax compliance · Taxes · Taxpayer

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1 Introduction

For financial policymakers in both developed and developing nations, achieving and sustaining high levels of tax compliance stands as a primary objective. The overarching aim of all tax administrations is to boost tax revenues that support the state's treasury. Indeed, tax revenues in Jordan account for over covering 50% of public expenditure coverage (General Budget Department, Jordan). Tax compliance presents a significant concern for tax authorities and policymakers, as non-compliance threatens the state's capacity to secure the financial resources necessary to meet its expenses [9]. Development and welfare rely on the contributions of the state, institutions, and individuals alike. Naturally, the execution of these programs demands resources and funding. Taxes serve as a vital source through which the state delivers its services and initiatives, embodying participation, citizenship, and equity in accessing services, projects, and programs.

As noted by Adimasu and Daare [2], the primary concern related to tax compliance is tax awareness. Consequently, this research seeks to investigate how the implementation of tax awareness policies influences taxpayer compliance in Jordan. Taxes are crucial for maintaining the budget of any government, as one of the key reasons for taxation is to provide financial resources for managing the economy and redistributing funds. A low rate of tax compliance can impede the government's capacity to fulfill its fundamental objectives, as it struggles to finance its treasury with the required resources. The focus of this study centers on how tax awareness policies can improve and enhance tax compliance.

The study's problem revolves around the main research question: "What is the impact of implementing tax awareness policies on tax compliance?" This leads to the following sub-questions:

1. What is the level of tax awareness among taxpayers in Jordan?
2. What is the level of tax compliance among taxpayers in Jordan?
3. Is there an impact of implementing tax awareness policies on the tax compliance of taxpayers in Jordan?

1.1 Study Objectives

The main objective of the study is to understand tax awareness and its effect on increasing compliance among taxpayers in Jordan. The main objective is divided into the following sub-objectives:

1. To identify the level of tax awareness among taxpayers in Jordan.
2. To determine the level of tax compliance among taxpayers in Jordan.
3. Explaining the impact of tax awareness policy implementation on taxpayer compliance in Jordan.

4. Providing recommendations based on the results to the relevant authorities to help improve and increase tax awareness and tax compliance among taxpayers in Jordan.

1.2 Study Hypotheses

Based on the study problem and questions, the following main hypothesis has been formulated:

- Main Hypothesis (H0): "There is no statistically significant effect of tax awareness on improving and increasing compliance among taxpayers."

The following sub-hypotheses are derived:

- (H01): "There is no statistically significant effect of taxpayers' awareness and understanding of the financial consequences of violating tax laws."
- (H02): "There is no statistically significant effect of taxpayers' awareness and understanding of the financial impact of non-compliance on the state's financial resources."

2 Theoretical Framework

Certain individuals perceive taxes as a financial imposition by the state on personal income, lacking any direct benefits for the taxpayer, with the intention of promoting public welfare. Conversely, others regard taxes as a collective financial contribution from taxpayers to support the state's treasury, which is essential for covering public expenses and serving the community. Taxes are also viewed as a mandatory obligation mandated by the state, which taxpayers must meet without expecting anything in return, thereby allowing the state to fulfill its responsibilities to the community [16].

According to Alwan [6], taxes are defined as "a monetary deduction imposed by public authorities on natural and legal persons according to their tax capacities, in a final and uncompensated manner, to cover public burdens and achieve state intervention." Key features of taxes include their compulsory nature, the requirement that payments be made only in cash, and their imposition by public authorities based on established legislative guidelines, collected from taxpayers without any compensation. Furthermore, taxes are gathered to attain public objectives and are levied on taxpayers in accordance with their financial capacity [4].

On August 16, 2004, the Income and Sales Tax Department was formed as a unified entity following its administrative merger, as stipulated by the Law Amending the Income Tax Law and the General Sales Tax Law, which was published in the Official Gazette, Issue No. (4672) on the same date. The Income Tax Department has its origins dating back to 1951 and functioned under Law No. (50) of 1950. Since its inception, tax legislation has seen numerous revisions aimed at adapting to economic

and social changes, with significant amendments enacted in 2018 through Law No. (34) of 2018. Prior to the merger, the Income and Sales Tax Department was recognized as one of the prominent national public sector departments, having achieved fourth place for the Income Tax Department and sixth place for the General Sales Tax Department in the King Abdullah II Center for Excellence in Government Performance and Transparency. Raising tax awareness is essential for motivating individuals to meet their tax responsibilities and evade legal repercussions. Tax awareness is characterized as "the sum of the taxpayer's ideas and concepts about the importance of taxes and how to fulfill them" [12].

Enhancing awareness about taxes is crucial, and this duty primarily rests with governments. However, it is equally the obligation of every citizen. As noted by Rawia [15], taxes serve as one of the key instruments of fiscal policy for governments. A fair and well-organized tax system, which encompasses effective tax regulations, is essential to fulfill governmental goals. Simultaneously, taxpayers need to embrace this tax framework and refrain from evasion or avoidance, as such actions adversely affect government finances [3]. It has been observed that taxpayers have yet to reach a mindset where they regard tax compliance as a moral obligation, making it understandable that they may struggle with adhering to tax responsibilities.

The researchers assert that tax compliance encompasses the taxpayer's commitment to following tax laws and regulations, which includes registering for taxes, timely filing of tax returns, accurately reporting income and expenses, legally claiming exemptions, and meeting financial responsibilities as outlined in their tax return.

Several studies have addressed this topic, including:

- The study conducted by Abbas [1], titled "The Impact of Tax Awareness on Reducing Tax Evasion: A Field Study Applied to Income Tax Payers in Tulkarm City," revealed a statistically significant correlation between tax awareness and the incidence of tax evasion.
- The primary conclusion drawn from the field study conducted by Khushnaw and Yabeh [13], titled "Analysis and Measurement of the Impact of Legislation and Tax Awareness on Trust between Taxpayers and the Tax Administration in the General Tax Directorate of the Kurdistan Region," indicates that trust between taxpayers and the tax administration is significantly and positively influenced by tax awareness. However, this trust is often undermined by skepticism stemming from complicated procedures, bureaucracy, and a lack of clarity, which in turn fosters financial and administrative corruption.
- The study conducted by Al-Sudairi and Al-Mas [5], titled "Tax Evasion and Its Relationship with Tax Awareness," revealed a significant understanding among accountants and auditors in Saudi Arabia regarding the concept and significance of tax awareness. They assert that tax awareness encompasses not only taxpayers but also various sectors of the state and the broader community.
- The study by Bojuwon and Obid [8], titled "Quality of Tax Services: The Mediating Effect of Ease of Use of the Online Tax System," emphasized a beneficial connection between the quality of tax services and the online tax system. It also

noted that taxpayers' comprehension of how to effectively utilize the tax system correlates with heightened tax compliance and revenue generation.
- The study by Mukasa [14], titled "Tax Knowledge, Perceived Tax Fairness, and Tax Compliance in Uganda," revealed a causal link between tax knowledge and perceived tax fairness with tax compliance. This suggests that enhancing taxpayers' understanding and their views on the fairness of taxes will lead to improved compliance with tax regulations.

3 Study Methodology

This research represents an empirical study utilizing a descriptive-analytical method. Information was gathered using a questionnaire divided into two sections: the initial section focused on collecting general information regarding the study sample, whereas the latter section assessed the effect of tax awareness policies on tax compliance in Jordan. The second part was divided into three sections:

- The first section explores taxpayers' awareness and understanding of the financial consequences of violating tax laws, consisting of 10 items.
- The second section investigates taxpayers' awareness of the financial impact on the state's resources due to non-compliance with taxes, also consisting of 10 items.
- The third section deals with data related to tax compliance, with 10 items.

A study population comprising all income and sales tax payers from the industrial, commercial, and service sectors in Jordan, amounting to 14,115 taxpayers (as per the records of the Income and Sales Tax Department, 2024), received a total of 708 distributed questionnaires. The data gathered was analyzed utilizing the Statistical Package for Social Science (SPSS) software.

4 The Result

4.1 Results of Descriptive Statistics for Demographic Variables of the Study Sample

- **Sample Distribution by Size**: 24% of the study sample were low-income taxpayers, 38.8% were average-income taxpayers, and 37.2% were high-income taxpayers.
- **Sample Distribution by Respondent Nature**: 37.1% of the study sample were natural nature, while 62.9% were of legal nature.
- **Sample Distribution by Sector**: 34.6% of the study sample were from the service sector, 43.6% from the commercial sector, and 21.8% from the industrial sector.

4.2 Results Related to the First Research Question

What is the level of tax awareness among taxpayers in Jordan? The findings reveal that taxpayers in Jordan exhibit a strong mean level of tax awareness, achieving an average score of 4.07 and a standard deviation of 0.48. This average surpasses the test standard of 3 on a scale of 5.

4.3 Results Related to the Second Research Question

To what extent are taxpayers aware of the financial impact on the state's resources due to their non-compliance with taxes? The results show a high mean level of awareness and understanding among taxpayers regarding the financial impact on the state's resources due to tax non-compliance.

4.4 Results Related to the Third Research Question

What is the level of tax compliance among taxpayers in Jordan? The results indicate a high mean level of tax compliance among taxpayers in Jordan.

4.5 Normal Distribution Test (Kolmogorov–Smirnov Test)

A Kolmogorov–Smirnov test was performed to assess if the data conformed to a normal distribution, and it was determined that the data did not adhere to this distribution. In response to this finding, a robust standard error method was employed, as suggested by Gujarati & Porter (2010). With 596 observations for the quantitative variables in the study, which exceeds the advised statistical threshold of 30, the application of multiple regression analysis was deemed appropriate.

4.6 Model Validation Test

The Variance Inflation Factor (VIF) test was employed in the study to assess multicollinearity among the variables. The results indicated that there was no multicollinearity present, as evidenced by the VIF values for tax awareness, which were both 1.142.

4.7 Hypothesis Testing

- **Null Hypothesis (H0)**: "There is no statistically significant effect of tax awareness on improving and increasing tax compliance among taxpayers in Jordan at a significance level of ($0.05 \geq \alpha$)".

In order to evaluate this hypothesis, the researchers employed multiple linear regression analysis to assess how tax awareness influences the enhancement and increase of tax compliance among taxpayers in Jordan. The computed F value was found to be 220.637, in contrast to the tabulated value of 2.39. Since the calculated value surpasses the tabulated value, the null hypothesis is rejected, and the alternative hypothesis is accepted, asserting that "there is a statistically significant effect of tax awareness on improving and increasing tax compliance among taxpayers in Jordan".

4.8 Sub-Hypothesis Testing

Sub-Hypothesis 1

- **Null Hypothesis (HO-1)**: "There is no statistically significant effect of taxpayers' awareness and understanding of the financial consequences of violating tax laws on improving and increasing tax compliance among taxpayers in Jordan at a significance level of ($0.05 \geq \alpha$)".

In order to evaluate this hypothesis, a simple linear regression analysis was conducted. The T-value obtained was 14.29, in contrast to the tabulated value of 2. As a result, the null hypothesis is rejected, leading to the acceptance of the alternative hypothesis, which asserts: "Taxpayers' awareness and understanding of the financial repercussions of violating tax laws has an effect on enhancing and boosting tax compliance among taxpayers in Jordan.

Sub-Hypothesis 2

- **Null Hypothesis (HO-2)**: "There is no statistically significant effect of taxpayers' awareness and understanding of the financial impact on state resources due to non-compliance with taxes on improving and increasing tax compliance among taxpayers in Jordan at a significance level of ($0.05 \geq \alpha$)".

In order to evaluate this hypothesis, a simple linear regression analysis was conducted. The computed T-value came to 6.352, in contrast to the tabulated value of 2. As a result, the null hypothesis is dismissed, while the alternative hypothesis is embraced, which asserts: "There is a statistically significant effect of taxpayers' awareness and understanding of the financial implications on state resources due to tax non-compliance on enhancing and boosting tax compliance among taxpayers in Jordan".

5 Results and Recommendations

The study reveals, through statistical analysis of the collected data aimed at fulfilling its objectives and addressing its issues, that tax awareness is essential for the effectiveness of tax policy in the fight against tax evasion. It is vital for each citizen to recognize that their tax contributions play a significant role in the development, growth, and prosperity of their community. The key factors influencing the enhancement and rise of tax compliance among taxpayers in Jordan include:

– **Awareness of Financial Impact on State Resources**: Understanding the financial impact on state resources due to non-compliance with taxes.
– **Awareness of Legal Consequences**: Understanding the financial consequences of violating tax laws.

Efforts need to concentrate on raising tax awareness among citizens and informing them about the significance of taxes as a means for the government to carry out projects and offer services that serve the public good. This can be achieved through various means, including:

- **Educational Campaigns**: Employing auditory, visual, and written formats to clarify tax laws, regulations, and procedures. Arranging targeted seminars to elucidate the details of tax laws, methods of calculation, collection procedures, and penalties associated with evasion.
- **Public Engagement**: Conducting educational and informative conferences for taxpayers to demonstrate the significance of tax revenues for public finances, the effects of the state's financial condition on economic stability, and the proper methods for calculating taxes.
- **Media Utilization**: Utilizing online platforms, graphic design, and videos to clarify tax laws and regulations. Offering digital tools and models for tax calculations while leveraging social media and various media channels to engage a broad audience of taxpayers, thus reducing the chances for exploitation and bribery.

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Enhancing Accuracy in Digital Fingerprint Analysis: AI Comparative Study



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Abstract The strong influence of technology on our lives reveals information about our online activity and preferences through digital fingerprinting. Understanding their components uses, and advantages are necessary for successfully navigating the digital universe. Approaches like deep learning are employed to find out which algorithm is the best for digital fingerprint analysis. ML algorithms have been used for a long time to make the existence of human civilization easier and more efficient. In this study, we trained techniques and classifiers such as neural networks (NN), support vector machines (SVM), Gaussian Naive Bayes classifier, K-nearest neighbors (KNN), Principal Component Analysis(PCA), Logistic Regression, Neural network, and Random Forest Classifier, and Decision Tree. We learned a method for understanding datasets and implemented several classifiers for analysis with this work. Algorithms used in digital fingerprinting are also discussed based on these techniques.

Keywords Digital fingerprints · Neural networks (NN) · Support vector machines (SVM) · Naive bayes · And K-nearest neighbors (KNN) · ML algorithms ·

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Cybersecurity · Technology shocks · Technological progress · Scientific and technological progress

1 Introduction

Fingerprints have fascinated people for centuries, serving as unique identifiers. Now, in the digital age, fingerprints have a digital counterpart, leaving behind data trails [1]. These digital fingerprints can be analyzed by complex algorithms and machine learning models to identify patterns. As technology evolves, digital fingerprinting will become more intricate, incorporating data from wearable and smart home technologies [2]. While concerns about privacy invasion are valid, digital fingerprints can be leveraged for positive purposes like fighting crime [3]. It's crucial to find a balance between utilizing digital fingerprints and protecting individual privacy through transparency, ethical standards, and effective data protection.

2 Digital Fingerprints

In the digital world, digital fingerprints uniquely identify individuals through their online behavior and device attributes. They offer insights into our virtual activities and interests, making it crucial to understand and navigate these traces safely.

A. Components of Digital Fingerprint

In the digital world, our online activities leave behind persistent traces that form a detailed picture of our virtual identities. These remnants influence how we are targeted and assessed online. Understanding the impact and potential biases in these electronic footprints is essential for navigating the digital realm responsibly. The data we leave behind—such as browsing history and geo tags—shapes perceptions even when we're not present. Examining these elements reveals the unseen effects of our digital presence [4].

B. Network Characteristics

In the vast digital world, our every click and scroll leaves a trace, forming a portrait of our virtual identity. Here's a look at key network characteristics related to our digital fingerprint:

- IP Address: Acts as a location beacon. Dynamic IPs offer more anonymity, while static IPs provide precise location details.
- Device Fingerprints: Unique to each device, created through graphics card details, WebGL performance, and other device-specific traits.
- Network Routing Patterns: Data packets' travel paths reveal connections and affiliations, potentially identifying geographic proximity.

- Anonymity: Tools like VPNs and mesh networks obscure your online trail, while decentralized protocols challenge fingerprinting by distributing data.
- Privacy and Security: Balancing user privacy with identification needs requires careful data collection and robust anonymization techniques.
- Evolving Fingerprinting: As fingerprinting methods advance, so do anonymization tools, creating an ongoing balance between identification and privacy. Staying informed on these changes is crucial for maintaining privacy while ensuring security.

C. Browser and Device Attributes

Browsers and devices subtly disclose personal information through their attributes. Browser plugins and extensions reveal online habits and preferences, such as attitudes towards ads and security concerns [5, 6]. The operating system and device model indicate tech-savviness and spending capability. Font choices and language preferences reflect personal tastes and cultural background. While these details enhance personalization and security, protecting user privacy through strong anonymization and transparency is crucial [7]. As technology evolves, so do these attributes, making continuous and responsible handling essential.

D. Web and App Interactions

Our digital fingerprints, shaped by interactions with websites, apps, and search queries, reveal much about us. Websites visited and the time spent on them create profiles indicating interests and engagement levels [8]. App usage reflects preferences and habits, though tracking raises ethical issues. Search queries offer insights into our knowledge and emotional states, with varying effectiveness of anonymous search options. Balancing personalization with privacy is crucial, requiring opt-in mechanisms and transparency. As digital engagement evolves with new technologies, fingerprinting methods must adapt to maintain accuracy and respect for privacy [9].

E. Behavioral Patterns

Our online actions, like clicks and searches, leave behind a pattern. These patterns are like the pieces of a puzzle, telling us about our habits, daily routines, and feelings. Let's look closer at these interesting clues and see what we can learn.

(1) Mouse Movements and Clicks

Think of mouse movements like a dance. Your clicks are the beat. Careful, slower clicks might show you're being thoughtful or unsure. Quick scrolling may tell us you're in a hurry or want to absorb a lot of information fast. Checking these actions can give us clues about whether you're right or left-handed, how long you pay attention, and your feelings [7]. But remember, things like the mouse sensitivity or the layout of a webpage can change these actions. That's why we need to be careful when we analyze this info.

(2) Keystroke Dynamics

Your typing style is as unique as a fingerprint. This includes your speed, pause times, error rates, and more. This can also help identify your mood! Fast typing might mean you're excited or frustrated. Making errors often might mean you're stressed or tired [10]. But watch out! Using typing patterns in harmful ways can be a big problem. That's why it's so important to keep all data private and safe.

(3) Temporal Activity Patterns

Your online behaviors show a lot about your day-to-day life. This can include the websites you visit and when. It might also show your work hours, travel plans, or even when you sleep! This information can give helpful clues about your lifestyle B.

(4) Understanding vs. Intrusion

Studying behaviors is super handy to figure out what users like and make their experience better. But you gotta be careful, there's a thin line between helpful info and spying on people. Being sure to ask people if it's okay, making user data anonymous when it should be, and letting users be in charge are key to being fair in this area [11].

3 The Algorithms and Classifiers

A. Neural Network (NN)

A Neural Network (NN) is a computational model inspired by the human brain, consisting of interconnected layers that process data in stages. Used in applications like handwriting recognition and weather forecasting, NNs are known for their ability to train on large datasets and recognize patterns. Their depth, or number of hidden layers, plays a key role in their functionality [12].

B. Principal Component Analysis

Principal Component Analysis (PCA) reduces dimensionality by identifying the most informative features in large datasets. It finds the characteristics that contribute most to variability, creating principal components that capture significant patterns. By prioritizing features based on the variance they explain and combining them into uncorrelated components, PCA simplifies the data while retaining essential information, making it easier to analyze.

C. Logistic Regression

For categorization and predictive analytics, this kind of statistical model—also referred to as the logit model—is frequently employed. Logistic regression uses a dataset of independent variables to estimate the likelihood of an event occurring, such as voting or not. Because the result is a probability, the dependent variable has a range of 0 to 1. A logit transformation is performed to the odds in logistic regression,

which are the likelihood of success divided by the probability of failure [13, 14]. This logistic function is sometimes referred to as the log odds or the natural logarithm of odds. It is expressed by the following formulas:

will serve as a provider and n + 1 nodes that will serve as contributors for all information.

$$h\vartheta(x) = g\left(\vartheta^T\right) = \frac{1}{1+e^{-x}}$$

$$g(x) = \frac{1}{1+e^{-x}}$$

Fundamentally, logistic regression creates a link between the probability domain and the world of independent variables. The method creates a sigmoid curve, sometimes referred to as the logistic function, given a series of data points with known "yes" or "no" labels (such as a spam email or credit card fraud). The values of the independent variables are elegantly mapped to the likelihood that the event (such as the email being spam) would occur by this curve. The algorithm finds the ideal parameters that define the curve by optimizing the chance of seeing the real labels. This enables it to anticipate the probabilities for new data points with accuracy [15].

Although logistic regression excels in binary classification, it has a broad family that meets a range of purposes. Let's examine a few of its variations:

(1) Multinomial Logistic Regression: This technique ex- tends the sigmoid curve into many curves, each of which represents the likelihood of a different class when there are more than two potential outcomes.
(2) Penalized Logistic Regression: In certain cases, noisy or superfluous characteristics may be present in the data. In order to counter this, methods like as L1 and L2 regularization penalize the model's complexity in favor of simpler curves that have higher generalization to unknown data.
(3) Mixed-effects logistic regression uses random effects to account for these nested relationships in order to provide more accurate predictions within these groups when working with data that naturally has hierarchical patterns [12].

D. Support Vector Machines (SVM)

Support Support Vector Machines (SVMs) are supervised learning algorithms used for classification and regression. They work by finding the optimal hyperplane that separates different classes with the largest margin, enhancing classification confidence and reducing overfitting [11]. SVMs are effective for complex data and offer high accuracy in various applications.

Although SVMs are inherently supervised, some techniques adapt them for unsupervised learning:

Spectral Clustering with SVM Kernels: Uses SVM kernels to create a similarity matrix, which spectral clustering then uses to find data clusters [16].

Semi-Supervised Learning: Combines a small amount of labeled data with a larger set of unlabeled data. The SVM is trained on labeled data and then refines its predictions on unlabeled data [17, 18].

One-Class SVMs: Used for anomaly detection, these SVMs identify outliers by defining a boundary around normal data points.

Understanding both linear and nonlinear SVM approaches helps in selecting the best method for your specific data and task [19].

Understanding the line that makes the best use of space between classes is key. It boosts the chances of translating well to unseen data. There are two categories in SVM:

(1) Linear SVMs: Linear SVMs operate in a linearly sep- arable space, meaning a perfect hyperplane can completely separate the data points belonging to different classes. The optimal hyperplane maximizes the margin by minimizing the distance between itself and the closest data points of each class, called support vectors [20]. Mathematically, this translates to

(1) Objective Function: Minimize:

$$\frac{1}{2}\|w\|^2$$

Subject to:

$$y_i * \left(w^T * x_i + b\right) >= 1$$

for all i

- w and b are the parameters of the hyperplane: w—direction vector, b—bias term.
- x_i and y_i are the $i(th)$ data point and its corresponding class label.

(2) Lagrange Duality: Due to the quadratic objective func- tion, SVMs are often solved using Lagrange duality, which converts the constrained optimization problem into an unconstrained dual problem.

(1) Non-Linear SVMs: Real-world data is rarely perfectly linearly separable. For such cases, SVMs employ a kernel trick that projects the data into a higher-dimensional feature space where linear separation becomes possible. Common kernels include:

- Gaussian kernel: $K\left(x_i, x_j\right) = \exp\left(-\text{ gamma} * \left\|x_i - x_j\right\|^2\right)$
- Polynomial kernel: The Polynomial kernel takes an ad-ditional parameter, 'degree' that controls the model's complexity and computational cost of the transformation $K\left(x_i, x_j\right) = \left(x^T * x_j + c\right)^d$

The choice of kernel and its parameters significantly impacts the performance of the non-linear SVM.

E. K-Nearest Neighbors (KNN)

K-Nearest Neighbours (KNN) is a basic yet effective machine-learning technique that may be used for classification and regression problems. It is a non-parametric,

supervised learning classifier, which uses proximity to make classifications or predictions about the grouping of an individual data point. It works by identifying the K closest neighbors to a new data point and then predicting the label of the new data point based on the labels of the K nearest neighbors [21].

It is a non-parametric method, which means it makes no assumptions about the data distribution. As a result, it is a flexible approach that can be used to a wide range of data formats [22]. During training, KNN does not learn a model. It simply saves the training data and utilizes it to generate predictions during testing. As a result, KNN is a relatively efficient method to train and use. KNN has symmetrical names.

(a) Memory-Based Reasoning
(b) Example-Based Reasoning
(c) Instance-Based Learning
(d) Case-Based Reasoning and
(e) Lazy Learning.

To assess any machine learning algorithm, we generally consider three critical aspects:

(1) Ease to interpret output
(2) Calculation time
(3) Predictive Power

KNN is found by using two techniques

(1) Equlidian Distance: Measures the ”straight-line” dis- tance between two points in a multi-dimensional space.

$$d_{\text{euclidean}}(x, y) = \sum_{i=1}^{\text{n}} (x_i - y_i)^2$$

(1) Manhattan Distance: Measures the sum of the absolute

differences between corresponding coordinates of two points.

$$d_{\text{manhattan}}\,(x, y) = \sum_{i=1}^{p} |x_i - y_i|$$

F. Gaussian Naive Bayes classifier

Using Bayes' Theorem as its foundation, naive Bayes classifiers are a group of classification algorithms. It's not just one algorithm; rather, it's a family of algorithms that are united by a single premise. Each set of traits being categorized is distinct from the others [23, 24]. In most real-world scenarios, the assumptions made by Naive Bayes are incorrect. The independence assumption is never true, even though it frequently functions effectively in real life. At this point, understanding the Bayes theorem is crucial. Bayes' Theorem [25].The Bayes Theorem calculates an event's

likelihood based on the likelihood of an earlier occurrence. The following equation represents Bayes' theorem mathematically:

$$P(C|X) = \frac{P(X|C) * P(C)}{P(X)}$$

where A and B are events and $P(B) \neq 0$.

- Basically, we are trying to find the probability of event A, given that event B is true. Event B is also termed as evidence.
- P(A) is the priori of A (the prior probability, i.e. Probability of event before evidence is seen). The evidence is an attribute value of an unknown instance(here, it is event B).
- $P(A|B)$ is a posteriori probability of B, i.e. probability of event after evidence is seen.

C. Decision tree classifier

For Decision trees classify and predict by using a tree structure where each node tests an attribute, branches represent outcomes, and leaves indicate class labels. The tree is built by recursively partitioning the data until further splitting is ineffective or all data points in a subset have the same label [26]. To classify an instance, you follow the tree from the root to a leaf, which provides the classification result.

H. Random Forest Classifier

Random Forest, An algorithm for supervised learning. An ensemble of decision trees that have typically been trained using the "bagging" technique makes up the "forest" it creates [27].

The bagging method's general tenet is that the total outcome is increased by combining many learning models [28]. The ability of Random Forest to handle both classification and regression problems—problems that comprise the bulk of existing machine learning systems—is one of its main advantages. Moreover, it withstands the overfitting that decision trees exhibit [29–31].

Random forests are based on the idea of ensemble learning, in which several models work together to provide better results. Instead of depending on a single tree, it builds many decision trees, each of which is trained using a different subset of the features and data. Every tree has a vote, and the average of all the projections or the majority vote determines the final prediction [32].

4 Experimental Dataset and Methodology

In the present study, a dataset used was NSL-KDD, it includes data on the digital fingerprint left. The data includes protocol types that are being used and outcomes. The analysis has been performed in the Kagle platform running on (an Intel i7

processor) with 8 GB RAM installed. The data set is taken as input for the feature extractor and classification algorithm. The datasets are passed through a sequence of pre-processing blocks [33].

The main tools that allowed us to work through all the phases of the machine learning process but the deployment were: Scikit-Learn v0.23.1, Tensorflow v2.1.0, Pandas v1.0.5, and Numpy v1.18.5. These supplied us with all the core functionality we needed for handling our dataset, modeling, and evaluating. However, we also made use of some complementary libraries. Concretely, for visualization, we employed Kaggle 1.5.16, and for the transformation of IP-related features, Netaddr v0.8.0.

(1) Different data in the current study singular data set has been used. This dataset was downloaded from the ML repository UCI.
(2) Pre-processing After the gathering of data, the next phase is to perform the preprocessing of the collected data. It is the technique that changes the raw data to an understandable format.
(3) Filtering after preprocessing of data next phase is to filter the data. Removing all the useless data to have a useful set of data.
(4) Normalization it is a stage in which all the values are changed to values between 0 and 1. The reason for standardization is to attract the information to an alternate scale
(5) ML algorithms after normalization, different algorithms were used such as PCA, and logistic regression. KNN, naive Bayes classifier, ANN, SVM, random forest clas- sifier, and decision tree.
(6) Validation In the validation10-fold cross-validation method is used. To create the training and testing sets, all normalized features are randomized before they can be used to train along algorithms PCA, and logistic regression. KNN, naive Bayes classifier, ANN, SVM, random forest classifier, and decision tree are evaluated for three nearest neighbors (k=3) with distance metric as Euclidean. The separation is computed between test information and every case of preparing information.

5 Results

Various criteria are to be considered to find the best algorithms among all the algorithms [34]. The best algorithm is determined by the particular job and the properties of the dataset. Think about the characteristics, goals, and type of data. Interpretability of the algorithms, Decision trees, and other algorithms makes it simpler to understand how decisions are made [35, 36]. This can be important in fields where it's critical to comprehend the assumptions that underlie forecasts. Computational Efficiency is also considered, Taking into account the amount of time and money needed for prediction and training [37]. For example, neural networks can require large amounts of processing [38]. Evaluate the possibility that algorithms may lose their capacity

to generalize after overfitting the training set. Methods like as cross-validation can assist in reducing this risk.

Result			
Classifier/Algorithm	Accuracy	Precesion	Recall
GaussianNaive Bayes classifier	91.80	92.62	89.47
Support Vector Machines	96.22	95.44	96.48
Neural Network	98.97	97.55	98.80
K-Nearest Neighbors	99.05	99.22	98.73
Decision tree classifier	99.99	100	99.98
Random Forest Classifier	99.99	99.98	99.99

The results according to the table were that Principal Component Analysis (PCA): obtained 99.99% recall, near- perfect accuracy, and precision for all measures. This implies remarkable efficacy in diminishing dimensionality and proficiently encapsulating data variation. Similarly impressively performing with 99.99% accuracy, 100% precision, and 99.98% recall is the Decision Tree Classifier. This suggests that it can create decision rules that correctly categorize data points. Random Forest Classifier: 99.99% accuracy, 99.98% precision, and 99.99% recall while maintaining a high degree of performance. Several decision trees are used in this ensemble approach to increase overall resilience.

Among others some of the strong contenders are Neural Network: Demonstrates excellent results with 98.97% accuracy, 97.55% precision, and 98.80% recall. This suggests its adeptness at learning complex patterns and making accurate predictions. K-Nearest Neighbors (KNN): Achieves impressive scores of 99.05% accuracy, 99.22% precision, and 98.73% recall. This indicates its effectiveness in classifying data based on proximity to known data points.

6 Discussion and Summary

Our online activities leave behind digital footprints that subtly reveal hidden information. Analyzing these traces can unlock powerful insights, with algorithms like Principal Component Analysis (PCA), Decision Trees, and Random Forests demonstrating exceptional accuracy, similar to a highly skilled Sherlock Holmes unraveling complexities. Neural Networks and K-Nearest Neighbors also shine with unique capabilities. However, this is just the beginning. The future promises new methods to enhance these techniques, from fine-tuning algorithms to developing specialized fingerprint features. Exploring ensemble methods and deep learning could offer even deeper insights into our digital lives. Remember, each digital trace left behind is being pieced together by machine learning detectives, unraveling the mysteries hidden in your online presence.

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Technological Advances in the Legal Framework for Continuous Crimes



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Abstract This study examines the evolving legal mechanism governing the regulatory framework and penalties for continuing crimes and the role of technological advances in shaping the legal approach, classification, and prosecution and enforcement of continuing crimes. Continuing offenses are defined as offenses based on ongoing criminal activity where the offense is committed as a continuous act or course of conduct rather than as a single act. They often require a sophisticated monitoring and control mechanism due to their persistent nature. In this context, technological advances such as digital surveillance, data analysis and automated reporting systems have a role to play in effectively combating and prosecuting continuous crime. The study will demonstrate the legal framework governing the regulatory system and penalties imposed for such crimes, the role of technology and how technological tools are used to locate, track and identify criminals and crimes. The implications for the criminal regime and legal procedure, and more specifically how these technologies offer better ways of dealing with ongoing crime, will be discussed next.

Keywords Crimes · Continuous crimes · Criminal act · Criminal result

1 Introduction

The problems of continuities criminal activities are of great significance for the legal system, as they seriously hamper the work of judiciary and law enforcement agencies in identifying and fighting them. The aim of this research is to explain what continuous crimes are and how they affect society. In the course of it, we will deal with their legal foundation and formative elements, also classification along with the penalties attached to these crimes. Besides, it will be discussed what should be done legally for fighting against these crimes and that the role of government or public involvement should not be ignored.

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Indeed, the legal framework for continuous crimes plays an essential role as it entails specifying the legal frameworks and procedures that should be in place to effectively fight and bring to book the people responsible for such types of crimes. The establishment of statutes that accurately address and respond to continuous crimes helps the judiciary to ensure fairness in its jurisdiction and guarantee protection of the rights of those affected by this kind of crime. Also, legislation contributes towards monitoring well continuous crimes so as to prevent their high numbers and consequently increase overall safety and stability of people.

2 Nature of Continuous Crimes

The types of crimes which are called 'continuous crimes' can be defined as such types of crimes that are performed and interconnected in a single system, i.e. a series of actions or negligence that form one whole crime, which is active for a certain period. Any of the acts or omissions during this period contributes to the formation of this particular crime. A distinct feature of these types of crimes is that they are determined by their permanent character caused by criminal behavior occurring over a long period of time, as opposed to transitory crimes which develop at the specific moment and are not likely to recur later on. Legal definition and regulation of these crimes are necessary to bring justice and deal with crime effectively.

2.1 Distinguishing Continuous Crimes from Others

Jordan has adopted the concept of continuous crimes, a product of its domestic legislation and related laws to this type of crime. In such cases, that is when a crime endures through time, it is regarded as an ongoing single criminal act that occurs over a duration of time. This kind of crime has been recognized by law [1]. Regarding ongoing offenses, relevant legal provisions involve statutes and legislation that pinpoint the criminal text for this kind of act and set the definite criminal sanctions that should be imposed. One crucial provision is the Jordanian Penal Code which has well-structured chapters addressing continuous crimes with each chapter detailing the legal procedure to be followed in case of its commission.

A continuing offense is a crime that is characterized by a wrongful act or omission such that it is capable of being maintained without regard to the length of time involved in its commission and does not require repeated criminal acts as an interventionist measure. An example of this type of crime would be the offense of hiding stolen goods, where the act of hiding commences at one particular moment and then time introduces itself, leading to the perpetuation of keeping them concealed throughout all subsequent time. The commission of a crime is not deemed to have ceased until time has passed and the perpetration state has concluded. The consummation of a crime is not over just with the act of concealing or possessing, after

the crime has already taken place because the quality of continuity is absent in the offense as an element but rather it is a characterizing trait of the behavior that makes up this offense. The intended continuance legally consists of two types:

1. In a continuous offense, the unlawful act continues to exist over a certain period without the need for a new intervention by the offender. For instance, this type of crime includes erecting a building against zoning laws without consent or even placing signs in areas where it is prohibited. In such circumstances, there are also immediate acts only once and remain an uninterrupted process for life with no additional act by the offender.
2. The renewed perpetration of a crime, which continues with the intervention of the offender in an organized and calculated manner aimed at maintaining the essential material elements of the crime. In this case, for instance, such crimes may be managing a café without registration and license or failing to report a birth or death incident within the legal deadline where the offender's volition retains mastery over them.

In penal law, criminal cases result from such ongoing offenses that combine the material and spiritual elements simultaneously and voluntarily, which determine an offense's quality whether it is time-limited or a continuing act. In continuing acts, both physical and mental elements coincide. This implies that the law is not satisfied with the existence of only the physical element but also there must be an intention on the part of the perpetrator to continue and achieve continuity. If these two elements do not happen concurrently as prescribed by law, and if continuity prevails only in the physical element itself, then we deal with a crime limited in time but yet having continuous effect rather than a continuing act. As a result, time is viewed as one of the most important factors in continuous crimes. After a while, these effects can change or deepen, and their impacts can become larger and have more destructive consequences not only on society but also on individuals. These types of crimes may eventually fade away or evolve into some other persistent form of criminal activity. Failure to timely identify and punish continuous crimes could result in an unending menace to society as well as further criminals' confidence that they would go scot-free for life. The perpetration of crimes can be divided into continuous crimes according to their type and if they are directed at the person or the property of the victim. Continuous crimes are violations of the law that require legal and punitive measures by the competent authorities as follows [2]:

- Physical Continuous Crimes: Continual criminal activities extend over months and can include situations where bodily harm is inflicted over long periods of time. Such crimes may be associated with persistent physical assault, torture, sexual abuse, or repeated damage to body parts. These offenses are unique due to their severe infringement of individual rights and perpetuation; they should therefore be categorized specifically and punished accordingly as their ongoing nature severely affects society.
- Financial Continuous Crimes: These are some ways that offenders use to defraud others and manipulate funds, which are done over a period of time. They may

include crimes like embezzlement, financial fraud, or even money laundering being performed in an ongoing process. These crimes have the suspect repeating them for some time, after they have been performed once before. As such, these crimes should be combated through immediate legal measures so that the offenders can be apprehended and prevented from causing further economic harm.

Some illustrative examples of continuous crimes include [3]:

- Ongoing Fraud: Perpetual delinquency is a specific criminal act that involves resorting to fraudulent and repetitive procedures aimed at controlling cash or wealth over a period of time. It can be through lies and false information that offenders deceive victims into trusting them and investing in lucrative ventures, yet eventually, they are defrauded of their savings. Persistent fraud is not easy to detect as it tends to take place over a longer duration. The outcomes of this felony are profound losses in terms of money on the part of victims as well as distrust, which affects their financial stability.
- Continuous Threat: Continuous threats pose another form of unending violation in which an individual remains constant in menacing and harassing the target for a significant duration. In this case, the offender relies on the fear factor by threatening physical or mental harm or exposing them to risks if they do not comply with his/her demands. Continuous threats can have a huge impact on the life of individuals, affecting their mental health; people can continue experiencing stress and fear indefinitely.
- Continuous Harassment: A form of criminal offense that is related to unending episodes of assault and harassment with no cessation is called continuous harassment. This would involve repeatedly terrorizing or annoying the victim with unwelcome physical acts such as inappropriate touching, sexual assault, or through vulgar language and constant threats. The attacker in this crime would continue to project continuous negative messages at the victim, ensuring he or she is humiliated, mistreated, and that a situation disrupting their daily living patterns is created. Victims of continuous harassment might suffer from serious psychological and emotional consequences which could adversely affect their personal and professional life as well.

2.2 Distinguishing Continuous Crimes from Others

Continuous crimes are criminal acts that continue over some period and involve the offender carrying out successive related actions. Time, act, and intent serve as common elements in these crimes. The crime ends when the offender ceases to commit it, and they often receive punishment for their activities after the completion of the entire crime. Instances of continuous crimes include ongoing scams or threats such as continuous defamation and persistent disturbance. However, transient crimes are single-point occurrences that revolve around specific actions perpetrated by a specific individual.

Some differences between temporary and continuous crimes are that they don't last over a long period of time and the punishments are immediate after the commitment. Examples of temporary crimes include theft, physical assault, and murder. These crimes differ in nature, prescribed penalties, as well as the possibility to stop them by others [4]:

In respect of the key components, both temporal crimes and continuous crimes consist of some elements. Continuous crimes are referred to as criminal activities that occur over a set period while temporary crimes involve criminal activities that occur at a given time or during a specific time frame. These types of crimes have many common key elements such as the temporal element, act element, and intent element [4].

- Temporal Element of the Crime: There is a temporal component that is vital to both continuous and sporadic crimes. In continuous crimes, the criminal activity carries on within a set time period and usually ends when it becomes detected or is halted by legal action. On the other hand, in sporadic crimes, the criminal action takes place at a certain time or shortly thereafter. However, in continuous crime, the temporal element is not just related to abstract time but also involves aspects of consistency and repetition of the act.
- Act Element: Both continuous crimes and temporary crimes share the same basic element called the act of crime. The act refers to the action or behavior that is committed as a part of the crime. In continuous crimes, this act is repetitive over some specific time and nonstop. On the other hand, in temporary crimes, it happens at a certain time, usually within a narrow temporal window. Consequently, both types of crime possess the act element which assists in their demarcation.
- Intent Element: The element of intent is a key component shared by both continuous crimes and single offenses. The intent element refers to the conscious choice or decision to engage in the criminal activity. Whether an offense is recurring or isolated, the offender will invariably have a fixed intent to execute the criminal act. The element of intent is seen as an essential element in establishing the proof for these two classes of crimes. The courts, through scrupulous evaluation of the legal intent, determine whether the act was a continuous one or done at a specific time that helps to arrive at the right classification of the crime.

One of the major distinctions between continuous crimes and temporary crimes is the nature of such crimes. Continuous crimes are those committed continuously over a stretch, whereas temporary crimes occur within a limited period. The typical continuous crimes vary, which are characterized by consistent frauds, threats, and harassment while the temporary ones include theft, physical assault, and murder. In assessing crime, the type of offense is deemed a significant factor in classifying crime as well as in understanding differences between a continuous crime and a temporary crime [5]:

- Nature of the Crime: Differentiation between continuous crimes and temporary crimes is based on the type of crime, which is a main difference between

them. Continuous crimes are committed over an extended period, while temporary crimes occur during specific periods. The nature of continuous crimes differs, and some examples may include relentless fraud, threats, and harassment, while temporary crimes may include theft, physical assault, and murder. In terms of how a crime is classified and the differences between continuous and temporary crimes, the nature of a crime is seen as one vital factor to be taken into consideration.

- Prescribed Penalty: Differences between continuous crimes and temporary crimes also depend on the prescribed penalty. In most cases, if a crime is defined as continuous, the legal punishment is likely to be severe and longer compared to temporary ones. This difference in punishment is well-founded because continuous crimes take place over a longer period of time and are committed more systematically, making them a larger threat to society in general, as well as having prolonged consequences for individual victims. Hence, the variation in the penalty imposed is one of the key factors that differentiate continuous crimes from temporary ones.
- Ability to Stop the Crime: The distinction between continuous and temporary crimes lies in the ease of halting the act. In continuous crimes, it might be hard to put an end to such crimes due to their incessant and unending nature. Conversely, for temporary offenses, law enforcement agents can easily terminate the criminal act as soon as a specific type of crime is over within a specific period. Thus, one of the key differences between continuous and temporary crimes lies in the ability to stop them.

Moreover, temporary and continuing crimes vary with regard to legal action imposed on the individuals responsible. Regarding continuous crimes, individuals might receive penalties of greater lengths as well as higher levels of intensity. For instance, someone who commits a continuous crime may be sentenced to several years or even life in prison depending on how severe the crime is and its sustained effects on society. For temporary offenses, the punishment mostly depends on individual circumstances of each criminal act and their effect on the victim. There are situations whereby the penalty might involve imprisonment, fines, or even monetary compensation for damage inflicted.

3 Legal Provisions Regarding Continuous Crimes

To fight crimes that are currently taking place, it is important to implement laws that can address these issues effectively and eventually put an end to their perpetration. These actions ought to encompass investigation with the aim of obtaining all the pertinent data required for establishing the commission of a present crime as well as recording it accurately. Moreover, proper measures need to be adopted so that prosecution and trial guarantee justice prevails and severe punishment is imposed on criminals in such circumstances. Following the ruling from the courts, it is also essential that penalties must be enforced swiftly and decisively which would certainly contribute towards eradicating such criminal activities from Jordan.

3.1 Legal Procedures for Continuous Crimes

1. Every place where the continuous activity is taking place is referred to as a location for a continuous crime. However, a continuous crime encompasses every location where it occurred, unlike temporary crimes which are confined to a single location.
2. The length or brevity of the duration of a continuous crime affects its legal status. The statute of limitations for a temporary crime begins from the day it was committed according to the Penal Code, whereas for a continuous crime, it starts from the last instance of the ongoing state.
3. Investigation and gathering of evidence during live incidents are amongst the most accurate, objective, and transparency demanding types of work. This should have the formulation of crime-specific units staffed by investigators experienced in this type of crime and who can carry out their duties quickly and effectively. All evidence and materials pertinent to the continuing crime must be documented accurately and fully such as witness statements, documents, technical reports, photographs, or videos. Finally, for a better outcome in collecting and analyzing evidence, it is important to use scientific, current techniques that ensure reliability and accuracy.
4. There are no existing legal proceedings in respect to the prosecution and trial of ongoing offenses which must be systematized and organized as per the rules. This starts from filing a suit and questioning witnesses and suspects. The availability of evidence must be established and legal arguments must be presented to prove that the crimes have been continuing and that the persons named in it are implicated in those crimes. The Prosecution Department and the Courts should ensure close cooperation for the rule of law's observance as well as fair administration of justice. In the framework of the specified legal norms, accused individuals should be given an opportunity to defend themselves and express their opinions. In turn, fairness and impartiality shall govern the conduct of a trial encompassing all relevant evidence and culminate in a just decision from a judge that determines an appropriate penalty for a continuous crime.
5. Following a criminal act, upon completion of the final court verdict to the offenses committed the proscribed penalties must be effectively and expeditiously implemented. The entities responsible for carrying out these punishments such as prisons and other relevant institutions should organize various practical measures to ensure this is possible such as where to house inmates and how to enforce penalty actions among others. It is paramount to guarantee a just and fair treatment of prisoners during their penalty term, respecting all their human rights. For the sake of welfare society has got its deserving part by putting convicts on rehabilitating track which becomes an effort from competent authorities who should apply punishment according to judicial decision and provide the right environment so that they can return to normal society after the term of the penalty comes to an end.

6. The role of technology as a tool in the process of evidence collection is particularly significant when dealing with criminal acts. Electronic devices, computers, smartphones, surveillance cameras, and other new-age technologies can be used to obtain and analyze information that is essential in gathering evidence. The use of technology also helps with physical evidence which provides strong proof towards achieving justice. Furthermore, through technology, the ability to track continuous crimes and identify patterns allows law enforcement agencies to apprehend culprits quickly. However, the implementation of technology needs special training for police officers as well as proper equipment to ensure the efficiency of the investigation.
7. In the investigation of continuous crimes, data and information analysis can be described as indispensable. It includes the study of patterns, connections, and trends related to the continuous crime. Data and information analysis start by establishing the criminality feasibility of a crime, determining its time, and finally understanding its objectives. Advanced forensic analysis implies the use of tools and cutting-edge technologies that help comprehend data. In order to conduct data and information analysis successfully one should possess strong analytical skills as well as proficiency in forensic analysis software and statistics. By using data and information analysis the investigation is more likely to be directed appropriately for precise results [6].
8. In the trial of continuous crimes, legal processes must be followed to guarantee that the trial continues and the perpetrator receives appropriate punishment. The court is assigned as the judicial body tasked with conducting the trial of continuous crimes, it oversees case administration, witnesses examination, and evidence presentation. The goal of a trial of continuous crimes is to make sure the judiciary comes to a fair conclusion on whether or not the crime is still taking place and, if there is proof that it has ceased already, will free the suspect. In this kind of crime, courts should handle them with great sensitivity and accuracy so as not to violate any rights and principles of justice [7].

The role of the court in the ongoing criminal trial is to monitor the course of the case and ensure that the proceedings are conducted fairly and lawfully. The court evaluates the evidence submitted and questions witnesses in order to establish whether or not a crime is still ongoing. Considering both evidence and witness testimony, if it can be established that a crime has terminated, then acquittal may be granted; if, however, it can be established that a crime persists, then an appropriate punishment may be imposed. The court plays a pivotal role in upholding justice and maintaining equilibrium between law and order when dealing with continuous crimes.

Presenting evidence and examining witnesses are vital aspects in the trial of continuing crimes. The parties involved have to put forward physical evidence and testimony showing that the crime is still happening. This will include supplying documents, recordings, and videos which bear on the current crime. Furthermore, persons who have seen or heard such a criminal act are capable of testifying in court

about it. By studying both the evidence and witnesses, the court can determine the status of the crime and whether it continues or has been discontinued.

3.2 Sanctions prescribed by law for continuous crimes

In this regard, it should be mentioned that a continuous crime does not have just a one-off criminal effect, but it can be realized in several points. The first point concerns the influence of such crimes on the sphere of criminal investigations. When a person commits a continuous crime, investigating it becomes quite challenging and prolonged. Detectives should track these offenses for weeks or months, conducting their ongoing research to accumulate evidence and collect information they need in order to find the criminal. This requires the use of specialized investigative resources and methods that are specifically targeted at addressing the nature of continuous crimes so as to make them detectable and identify the culprit with precision.

Impact of Continuous Crimes on Criminal Investigations

Long-term crimes are also critical in affecting criminal investigations. Apart from the complicities and continuing nature of the case, this means that additional resources have to be dedicated and more concerted efforts need to be made to monitor and track such crime and identify its offender. Similarly, these investigations may also need close collaboration and coordination with other institutions involved in the fields of security and justice. Additionally, the investigation of ongoing offenses demands advanced technologies involving highly specialized techniques in data collection and analysis. Investigators must also stay updated with current developments in forensic technology so as to use them properly, thereby increasing the productivity of investigations processes leading to the discovery of more crimes and identification of criminals.

Impact of Continuous Crimes on Penalties

Crimes that occur over an extended period of time may have an impact on the sentencing decision. In such cases, when a perpetrator is convicted of a continuous crime, the punishment is determined based on the duration and progression of the offense. Therefore, continuous crimes can result in more severe penalties being imposed on the offender. The court considers both how long and how deeply a criminal's activities are felt within society. This means that for continuous crimes, which go beyond offenses of a non-continuous kind, higher penalties could be established with a view to discouraging an offender and restoring justice through appropriate compensation according to their continuous nature [8].

The prescribed penalties for continuous crimes in Jordan consist of both criminal penalties and financial penalties. Criminal penalties are designed to punish and deter the perpetration of continuous crimes, where an individual is sentenced with a penalty specific to their offense upon conviction based on the applicable criminal laws in Jordan. On the other hand, financial penalties are part of the prescribed punishment for continuous crimes whereby the offender is required to pay a fine determined as per the rules laid down in Jordan's legal system.

Criminal Penalties

In Jordan, the criminal punishments imposed for crimes in a series are severe and strict, aimed to prevent and deter offenders. Some of the penalties that can be given include suspension of the guilty person for some time or being imprisoned for a period determined by how serious and frequent the offense is, accompanied by fines and other penalties. These are enforced as per laws on criminal law and prosecution in the legal system in Jordan [9].

Financial Penalties

In Jordan, it is common to impose fines as one of the statutory penalties for persistent offenses, which consist of the payment of a fine, determined on the basis of laws in force in the country. Financial penalties seek to discipline and dissuade criminals from the continuation of repetitive crimes; they equally work as instruments of repayment to restore the social harm brought about by such criminal acts. The financial penalties are executed by competent bodies using legal procedures and instructions set by Jordan [10].

Rehabilitation and Reintegration in Cases of Continuous Crimes

In cases when offenses are committed on an ongoing basis, it is necessary to apply not only punishment measures but also rehabilitation and reintegration activities. These latter ones have a goal to influence the offender's behavior so that he/she could start again being a part of society and lead a productive life. Rehabilitation measures may include offering therapy and psychological assistance to criminals that will contribute to quitting the criminal activity. Criminals can also be given educational and training opportunities as these would help them to improve their chances of getting a job after they are released from prison. By providing support for reentry, the goals of rehabilitation and reintegration are decreased recidivism rates and better futures for offenders [11].

With the help of security and legal authorities, prevention of further continuous crimes is the most crucial stage of this process to minimize their repatriation and proliferation. In particular, the security forces should ensure protection and safety in the community by intensifying security presence and consistently following laws. In turn, legal authorities need to be involved in identifying continuous crimes as well as prosecuting criminals. Collaboration should be based on close cooperation between security and legal authorities and constant exchange of information about continuous crimes to enable effective prevention measures.

The prevention of sustained crime relies on security and legal authorities as a part of their role in society. Security authorities contribute to public safety by increasing presence and upholding the law strictly. Intelligence operations help establish patterns of crime, focus efforts towards detection, and prioritize law enforcement intervention. Conversely, the legal authorities actively fight against criminals by instituting judicial processes that ensure punishments and justice are served. All these agencies need to work together with an objective understanding of their roles and responsibilities to achieve common goals in preventing continued crimes.

In respect of international regulation, cooperation between different countries is considered an essential measure against continuous crimes. It is recommended for governments to extend their cooperation with other countries in the areas of

exchange of information and experience, agreements signature, and implementation. Such cooperation may involve mutual training of judges and prosecutors on dealing with continuous crimes and exchange of legal and technological expertise. Additionally, it is imperative that international meetings and conferences be organized to exchange ideas, challenges, and successful experiences in combating continuous crimes. Through strengthening international collaboration, effective strategies can be devised to face these crimes and achieve justice at the global level.

4 Conclusion

A continuous crime is an organized and established offense recognized under the penal law of Jordan. It is a type of crime that involves an act that persists over a period of time regardless of its duration and requires repeated acts from the offender's intention to maintain the state of continuation after he/she has already committed it. The main difference between temporary crime and continuous crime relates to the manner in which the material act establishing the offense is conceived by law, whether the act is positive or negative, commission or omission. Continuous crime refers to those cases in which the criminal state is still persisting over time, whereas temporary is the one that occurs and ends with the act. In this case, the criteria of continuity are determined by repeated and renewed involvement of the criminal's intention with no consideration for either preparatory periods leading up to the commission of an act or subsequent periods in which its effects continue.

4.1 Results and Recommendations

Based on the study's findings, it can be suggested that several findings and recommendations were offered to improve the legal control system of continuous crimes in Jordan. One of them is raising the level of legal awareness among individuals and communities on this type of crime and its legal repercussions. Promoting this information and heightening people's understanding about the significance of reporting as well as collaborating with security agencies for containing these crimes would be quite essential. Another one should be better developing criminal policies regarding continuous crimes, which implies strict legislations and justice when applying punishment against offenders. As far as the enhancement of transnational continuous crime control is concerned, the issue of international collaboration and sharing ideas as well as information with other countries to combat such crimes should be paid attention to. In conclusion, research implies that investigation and evidence-gathering units should be strengthened and all suspects found out should undergo immediate trial after necessary procedural guarantees are provided; for instance, such as the right to a fair trial and defense. Such findings, which have been obtained from a careful scrutiny of reasons given in this article and supported

by legal materials concerning crimes, may contribute significantly to the prevention of these sorts of violations in the future.

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A Cross-Linguistic Investigation of Consonant and Vowel Distinctive Features: A Comparative Analysis between English and Arabic Sounds



Wafa Abu Hatab, Wala'a Abuzir and Mohammed Al-Badawi

Abstract This research conducted a comprehensive comparative analysis of distinctive features in vowels and consonants within the phonological systems of English and Arabic. The study explored the key phonetic elements, including length, stress, and tone in vowels, and the variations in manner of articulation across consonants. By using Jakobsson features of system pattern of English for the distinctive features. This study revealed that, English vowels, length serves as a secondary feature influencing vowel quality, with stressed vowels typically longer than unstressed ones. In Arabic, vowel length emerges as a critical distinctive feature, contributing to changes in word meaning. English consonant exhibited diverse manners of articulation, including stops, fricatives, affricates, nasals, and approximants, with variations in place of articulation. In contrast, Arabic consonants encompass stops, fricatives, nasals, and approximants.

Keywords Phonology · Arabic sounds · English sounds · Consonant · Vowels · Jakobson · Features · Distinctive

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1 Introduction

The phonological structures of Arabic and English languages, comprising consonant and vowels, play a role in shaping the spoken language. English language stand in contrast to Arabic languages. The contrast of these languages' phonologies lead to an exploration into the distinctive features that characterize their consonant and vowels. To investigate the features of each language sounds, it is essential to consider the system of distinctive features, a theoretical framework by the linguist Roman Jakobson. In the mid-20th century, Jakobson model has been developed, by providing a systematic way to categorize speech sounds based on binary opposition, speech sounds parameters such as, voicing, place and manner of articulation and others come into the distinctive features of sounds. Applying this framework for phonological analysis allow a comprehensive exploration of the distinctive features within English and Arabic languages [1].

Chapman and Routledge [2], defined the distinctive features as the "smallest units of linguistic structure, from which larger units are built, sometimes seen as the attributes by which phoneme can differ." The basic component as mentioned in their book, first to express how segments contrast with each other. Second, what group of segments formally have in common, thirdly, to model what changes in phonological processes. Finally, in the formulation of constraints in optimality theory [3].

Chomsky and Halle [4] redefined features using principally articulatory definitions, and used them in phonological rules, setting the scene for standard generative phonology.

1.1 Aim of the study

The primary purpose of this study is to conduct a comprehensive cross-linguistic analysis of the distinctive feature in the consonant and vowel system of English and Arabic. In this study the researcher seeks to unravel the features of these two languages according to the Jakobson theory of SPE system of distinctive features. The aim of the study will be reflected in the research questions below:

1. How do distinctive features such as length, stress, and tone manifest in English and Arabic vowels?
2. How do distinctive features related to manner of articulation vary across the consonant systems of English and Arabic languages?

1.2 Significance of the study

This study is significant because it investigates the distinct between Arabic and English sounds. It aims to show the difference between the features of consonant and vowel sounds. Moreover, it is significant to the manner features and prosodic features.

2 Literature reviews

This section should include previous studies related to our topic, under the distinctive features of phonology, but because the researcher did not find any paper related to this topic, she mentioned general research papers studied phonology in different topics.

A study by Al-Mazrouei et al. [5] explored the vowel system of Qatari Arabic, focusing on the acoustical cues of three long and three short monophthongs. The investigation delves into the qualitative differences between long and short vowels, specifically examining the influence of tenseness/laxness on vowels situated in peripheral/non-peripheral tracks within the vowel space. The data, collected from 21 speakers, analyzes acoustic parameters such as F1, F2, and duration across four phonetic contexts: labial, alveolar, uvular, and pharyngeal. The results unveil significant disparities between long and short vowels, positioning long vowels at the periphery of the vowel space, while short vowels exhibit a tendency towards more centralized positions. Additionally, the co-articulatory effect of preceding consonants is highlighted, with short vowels showing a more pronounced influence. Short high vowels /i u/ demonstrate a lowering towards the mid position, short low /a/ experiences fronting, and long low /aː/ undergoes retraction and elevation [6].

Lee and Jongman [7] investigated the three-way laryngeal contrast between voiceless stops in Seoul and South Kyungsang Korean dialects in terms of both acoustic and aerodynamic properties. They recruited 16 Korean-speaking males, half of whom spoke the Seoul dialect and half the Kyungsang dialect, and measured VOT, vowel onset f0, H1-H2, air pressure, and air flow. The influence of the presence or absence of lexical pitch accent on the acoustic and aerodynamic features of these stops was investigated. Their findings show that while Seoul speakers rely on a combination of f0 and VOT to signal the three-way contrast of Korean stops, Kyungsang speakers appear to rely primarily on VOT. Moreover, the presence of lexical pitch accent makes f0 an unreliable acoustic cue for distinguishing the three Korean sounds among Kyungsang speakers. Dialectal differences in VOT as a cue for three-way contrast reflect a transitional hypothesis, as VOT differences between lenis and aspirated stops in Seoul Korean have reportedly become less pronounced over the past 50 years [8].

3 Theoretical framework

Prague school of linguistics refers to a movement that originated in Prague. This movement particularly through the work of Roman Jakobson, had an influence on the development of phonology. Jakobson, a key figure in the Prague school, made a significant contribution to the phonological structure, by introducing the concept of distinctive features. Jakobson proposed a set of binary features that distinguish one phoneme from another. Each feature includes parameters like voicing, place of articulation, manner of articulation, and nasality. [9], mentioned that Jakobson approach was Typological, that concerned with the classification of the sound

systems of different languages to show the way phoneme inventories organized. In addition, Katamba mentioned that there are two aspects of, first Markedness and second, Binarism.

There is seven major classes, but this research will focus on two of them:

- Cavity features, Katamba mentioned that "Cavity features refer to the place of articulation**,** where in the vocal tract the air stream modified." Cavity features consists of four features represented as the following:
- **Coronal-non-coronal:** as mentioned on Katamba book page.44, to produce coronal sounds the blade of the tongue is raised to the front teeth, the alveolar ridge, or the hard palate. While in the non-coronal consonant the blade of the tongue remains in a neutral position.
- **Anterior-non-anterior:** sounds considered anterior, once they are produced with the primary construction which occurring towards the front part of the vocal tract. Which means where the tonne tongue moves towards the front of the mouth. By contrast the non-anterior sounds are produced without the primary construction that occurring towards the front part of the vocal track it.
- **Labial-non-labial:** sounds. Are produced with. The involvement of the lips. Non-labial sounds are those produced without direct involvement of the lips.
- **Distributed-non-distributed:** The term "distributed" refers to sounds where the constriction or articulation is spread over a larger area of the vocal tract. Non-distributed sounds are those where the constriction or articulation is localized to a specific part of the vocal tract, rather than being spread.

4 Methodology

This research aimed to explore the distinctive features of consonant and vowels in Arabic and English languages. The methodology section compresses two sections: data collection, and data analysis.

4.1 Data collection

The researcher collected divers corpus of words in English and Arabic languages. These words come under a specific sound of each language to facilitate the analysis and comparative between both languages. The data have been collected from different sources such as dictionaries. In addition, the researcher transcribed the data and listened the way native speaker pronounces the word depending on their accent.

4.2 Data analysis

In this research the researcher analyzed the data qualitatively by applying Jakobson distinctive features framework, each phoneme has been analyzed systematically based on manner features for consonant sounds and prosodic features for vowel sounds. Qualitative analyses reveal the distribution of distinctive features in both languages.

5 Results

5.1 English vowels

1. Vowel length:

Short vowel: "bit" /bɪt/

"ship" /ʃɪp/ "hop" /hɒp/ "cut" /kʌt/ "pet" /pɛt/

Long vowel: "beat" /biːt/

"sheep" /ʃiːp/ "hope" /hoʊp/ "coot" /kuːt/ "peat" /piːt/

2. Stress

Stressed vowel: "HÓr-rible" /ˈhɒr.ɪ.bl̩/

"REsearch" /rɪˈsɜːrtʃ/ "BLACKbird" /ˈblækˌbɜːrd/ "pick UP" /pɪk ʌp/ "unHAPPY" /ʌnˈhæpi/

Unstressed: "li-BRÁ-ry" /ˈlaɪ.brər.i/

"sofa" /ˈsəʊ.fə/ "candy" /ˈkændi/ "happen" /ˈhæp.ən/ "machine" /məˈʃiːn/

3. Tone:

English language uses pitch for intonation rather than lexical tone.

4. Rising intonation

"Are you coming to the party?" intonation raised at the end.

5. Falling intonation

"I will see you at the meeting." Here the falling intonation at the end indicated statements.

6. Pitch

"He did not say red, he said blue." The pitch emphasized on "red" and "blue" showed contrast between the colors.

5.2 English consonant

1. Coronal-Noncoronal

- Coronal

"time" - [taɪm] - The "t" is a coronal (alveolar) stop.
"dad" - [dæd] - The "d" is another example of a coronal (alveolar) stop.

- Noncoronal:

"cat" - [kæt] - The "c" (pronounced as /k/) is a noncoronal (velar) stop.
"queen" - [kwiːn] - The "q" (pronounced as /kw/) is a noncoronal (velar) stop.
"judge" - [dʒʌdʒ] - The "j" is a noncoronal (palato-alveolar) affricate.

2. Anterior-Nonanterior

Anterior:

"time" - [taɪm] - The "t" is an anterior (alveolar) stop.
"think" - [θɪŋk] - The "θ" is another example of an anterior (interdental) fricative.

Nonanterior:

"cat" - [kæt] - The "c" (pronounced as /k/) is a nonanterior (velar) stop.
"hope" - [hoʊp] - The "h" is a nonanterior (glottal) fricative.
"judge" - [dʒʌdʒ] - The "j" is a nonanterior (palato-alveolar) affricate.

3. Labial-Nonlabial:

Labial:

"bat" - [bæt] - The "b" is a labial (bilabial) stop.
"pencil" - [ˈpɛnsəl] - The "p" is another example of a labial (bilabial) stop.
"mop" - [mɑp] - The "m" is a labial (bilabial) nasal.
"vase" - [veɪs] - The "v" is a labial (labiodental) fricative.
"whale" - [weɪl] - The "w" is a labial (bilabial) approximant.

Nonlabial:

"cat" - [kæt] - The "c" (pronounced as /k/) is a nonlabial (velar) stop.

"think" - [θɪŋk] - The "th" is a nonlabial (interdental) fricative.

"dog" - [dɔg] - The "d" is a nonlabial (alveolar) stop.

"singer" - [ˈsɪŋgər] - The "s" is a nonlabial (alveolar) fricative.

"jazz" - [dʒæz] - The "j" is a nonlabial (palato-alveolar) affricate.

4. Distributed-Nondistributed

- Distributed

"sip" - [sɪp] - The "s" is a distributed (alveolar) fricative.

"measure" - [ˈmɛʒər] - The "ʒ" is a distributed (postalveolar) fricative.

"shoe" - [ʃu] - The "sh" is a distributed (postalveolar) fricative.

"sin" - [sɪn] - The "s" is a distributed (alveolar) fricative.

"ledge" - [lɛdʒ] - The "dʒ" is a distributed (postalveolar) affricate.

- Nondistributed

"hat" - [hæt] - The "h" is a nondistributed (glottal) fricative.

"hot" - [hɑt] - The "h" is a nondistributed (glottal) fricative.

"kick" - [kɪk] - The "k" is a nondistributed (velar) stop.

"loch" - [lɑx] - The "x" is a nondistributed (uvular) fricative.

"cat" - [kæt] - The "k" is a nondistributed (velar) stop.

5.3 Arabic vowels

1. Vowel length

Short Vowel:	"كَتَبَ"	(kataba)	- "he wrote"
Long Vowel	: "كَاتِب"	(kātib)	- "writer"

The lengthening of the vowel in the second example changes the word's meaning.

Short Vowel:	"شَمْس"	(shams)	- "sun"
Long Vowel:	"شِمَال"	(shimāl)	- "north"

Vowel length distinguishes between these two Arabic words.

Short Vowel:	"قِرْد"	(qird)	- "monkey"
Long Vowel:	"قَرَد"	(qarad)	- "ridiculous"

Vowel length contributes to the phonemic contrast.

Short Vowel:	"بَيْت"	(bayt)	- "house"
Long Vowel:	"بَات"	(bāt)	- "he spent the night"

The lengthening of the vowel changes the word's meaning.

Short Vowel:	"دِفْتَر"	(diftar)	- "notebook"
Long Vowel:	"دَفْتَر"	(daftar)	- "register"

Vowel length is distinctive in these two Arabic words.

2. Stress

"مَلِك"	(malik)	- "king"
"كِتَاب"	(kitāb)	- "book"
"قَرْد"	(qird)	- "monkey"
"يُكَتِبُ"	(yukatibu)	- "he writes"
"غَيْر"	(ghayr)	- "other"

3. Unstressed

دَرَسَ	(darasa)	- "he studied"
شِمَس	(shams)	- "sun"
كُتُب	(kutub)	- "books"
بُستَان	(bustān)	- "garden"
مِصْر	(Miṣr)	- "Egypt"

4. Tone

Tone in Arabic show as:

a (Fatha): Pronounced as [æ], as in "كَتَبَ" (kataba) - "he wrote."

i (Kasra): Pronounced as [i], as in "شِمَس" (shams) - "sun."

u (Damma): Pronounced as [u], as in "بُستَان" (bustan) - "garden."

The previous three sounds referred to short Arabic sounds.

ā (Long A): Pronounced as [a:], as in "كِتَّاب" (kitaab) - "book."

ī (Long I): Pronounced as [i:], as in "مِصْر" (Miṣr) - "Egypt."

ū (Long U): Pronounced as [u:], as in "بُستَان" (bustān) - "garden."

Finally, these three sounds refer to long Arabic vowel sounds.

5.4 Arabic consonant

1. Coronal-Noncoronal

- Coronal:

"تمر" (tamr) - [tamr] - The "ت" (taa) is a coronal (alveolar) stop.

"دم" (dam) - [dam] - The "د" (daal) is another example of a coronal (alveolar) stop.

- Noncoronal:

"كتاب" (kitaab) - [kita:b] - The "ك" (kaaf) is a noncoronal (velar) stop.

"قلب" (qalb) - [qalb] - The "ق" (qaaf) is a noncoronal (uvular) stop.

"جمل" (jamal) - [ʒamal] - The "ج" (jeem) is a noncoronal (palato-alveolar) affricate.

2. Anterior-Nonanterior

- Anterior

"تمر" (tamr) - [tamr] - The "ت" (taa) is an anterior (alveolar) stop.

"ثلاثة" (thalaathah) - [θala:θa] - The "ث" (thaa) is another example of an anterior (interdental) fricative.

- Nonanterior:

"كتاب" (kitaab) - [kita:b] - The "ك" (kaaf) is a nonanterior (velar) stop.
"خارج" (kharij) - [χari:dʒ] - The "خ" (khaa) is a nonanterior (uvular) fricative.
"جمل" (jamal) - [ʒamal] - The "ج" (jeem) is a nonanterior (palato-alveolar) affricate.

- Labial-Nonlabial:
  - Labial:

"باب" (baab) - [ba:b] - The "ب" (baa) is a labial (bilabial) stop.
"وقت" (waqt) - [waqt] - The "و" (waaw) is another example of a labial (bilabial) approximant.

- Nonlabial

"تمر" (tamr) - [tamr] - The "ت" (taa) is a nonlabial (alveolar) stop.
"ثلاثة" (thalaathah) - [θala:θa] - The "ث" (thaa) is a nonlabial (interdental) fricative.
"خارج" (kharij) - [χari:dʒ] - The "خ" (khaa) is a nonlabial (uvular) fricative.

3. Distributed-Nondistributed

- Distributed

(Alveolar): "سلام" (salaam)—"peace"
The "س" (seen) represents a distributed (alveolar) fricative.
(Postalveolar): "شجرة" (shajarah)—"tree"
The "ش" (sheen) represents a distributed (postalveolar) fricative.
سماء" (samaa)—"sky"
The "س" (seen) represents a distributed (alveolar) fricative.
(Postalveolar): "شمس" (shams)—"sun"
The "ش" (sheen) represents a distributed (postalveolar) fricative.

- Nondistributed

"كتاب" (kitaab)—"book"
The "ك" (kaaf) represents a nondistributed (velar) stop.
(Uvular): "قلب" (qalb)—"heart"
The "ق" (qaaf) represents a nondistributed (uvular) stop.
"كلمة" (kalimah)—"word"

The "ك" (kaaf) represents a nondistributed (velar) stop.

(Uvular): "قهوة" (qahwah)—"coffee"

The "ق" (qaaf) represents a nondistributed (uvular) stop.

6 Discussion

1. How do distinctive features such as length, stress, and tone manifest in English and Arabic vowels?

The distinctive features of English language are attributed to the various aspects of vowels, which include length, stress, and tone. Unlike languages like Arabic, English does not necessarily depend on vowel duration to communicate lexical meaning. In English, vowel length varies depending on surrounding sounds and stress, but it usually plays a supporting role in word recognition [10–12]. In contrast, stress is an important component of English rhythm. English is a stress-timed language, meaning that stressed syllables appear at regular intervals and have a regular rhythm. Reduced unstressed vowels frequently become more centered and prominent, like the schwa sound /ə/. Interestingly, there is no tonal system in English, therefore vowel pitch changes have no unique connotations.

The phonological system of Arabic is greatly influenced by the unique characteristics of its vowels, such as length, stress, and tone. In Arabic, vowel length is very significant since the difference between short and long vowels can alter a word's meaning. For example, there is a vowel length variation between "كِتَاب" (kitāb—book) and "كِيتَاب" (kītāb—my book). In Arabic, syllable timing is observed, and stress is less noticeable than in English. Syllable structure and vowel length influence stress patterns, suggesting that stress plays a less significant role in identifying word meanings. Arabic lacks tonality, just like English. Arabic relies on vowel length and quality to convey meaning, not pitch fluctuations, which are ineffective for word differentiation. Overall, Arabic's unique vowel characteristics add to the language's linguistic complexity and subtle semantics.

In conclusion, although Arabic and English both use vowels, their applications and meanings are different phonologically. English prioritizes stress for rhythmic patterns, whereas Arabic stresses vowel length more as a crucial component of word distinction. Neither language uses tone in the traditional sense of a tonal language; instead, phonemic differences are made using other elements [13–15].

2. How do distinctive features related to manner of articulation vary across the consonant systems of English and Arabic languages?

The phonological features of Arabic and English are influenced by the different patterns that each language reveals in the area of articulation. In English,

distinguishing between consonants is mostly dependent on articulation style. Numerous ways, such as stops, fricatives, affricates, nasals, and approximants, define the English consonant system. Stops, like /p/, /t/, and /k/, involve closing the vocal tract completely, which temporarily blocks airflow. When airflow is partially impeded, fricatives such as /f/, /s/, and /ʃ/ occur, producing a tumultuous noise. Fricatives and stops are combined in affricates, such /ʧ/ and /ʦ/. Next are noses (/m/ /n/ /ŋ/), which use the nasal passage in their articulation and allow air to flow through the nose. Finally, approximations (/l//ɹ/) involve greater taper than slots but less taper than stops.

Unlike Arabic, the consonant system of Arabic has some unique features in place of articulation. In Arabic, a consonant system similar to English in terms of articulation includes stops, fricatives, nasals and approximate. Consonants include /b/, /t/, /q/ etc. Arabic stops are similar to English stops in terms of articulation, except that they may differ in place of articulation. Fricatives in Arabic include /f/, /s/ and /x/. English does not have /x/, which is a uvular, voiceless uvular. The Arabic consonant system has a unique set of emphatic consonants (/tˤ/, /dˤ/, /sˤ/, /ðˤ/, /zˤ/) in terms of its manner of articulation because it has a constriction of the throat. In addition to hyphens and fricatives, the Arabic consonant system contains certain pharyngeal sounds, including /ħ/ and /ʕ/, representing pharyngeal fricatives in voiceless and voiced forms.

7 Conclusion

To sum up, this research work reviews the differentiation of English and Arabic speech sounds according to Jakobson's theory. The researcher specifies how the data was analyzed in only two characteristics; in two main class features and prosodic features. Future research in the field of phonology could be applied by using more features in two or more English and Arabic languages to show how they differ from each other phonemes.

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Distinguishing Between Treasury Stock and Redeemable Shares in Technology Firms: A Legal and Legislative Analysis



Yasar Alhiniti and Dina Aljabari

Abstract The objective of this study is to shed light on the distinctions between treasury stock and redeemable shares in the context of company law, with a focus on the legal, financial, and digital aspects. It examines the similarities and differences in the processes of a company repurchasing its own shares (treasury stock) and redeeming shares, and analyzes the impact of these processes on shareholders and the company's financial position. The study reveals that both processes are exceptional and have significant implications for shareholders, as they involve their exit from the company and affect their financial standing. However, there are notable disparities between the two processes, including the governing laws and regulations, the mechanisms employed, and the impact on shareholder rights. Furthermore, the study explores the role of digital technologies and platforms in facilitating these processes, such as electronic share management systems and digital transaction records. It delves into relevant regulations, such as stock purchase instructions and redeemable shares instructions, and evaluates their effectiveness in safeguarding shareholder rights and ensuring fairness and transparency. The study also provides recommendations for enhancing these regulations and incorporating digital tools to promote company continuity and fairness among shareholders. In conclusion, a comprehensive understanding of the disparities between treasury stock and redeemable shares, coupled with the proper implementation of regulations and digital technologies, contributes to transparency, protection of shareholder rights, and achieving financial equilibrium for companies.

Keywords Treasury stock · Redeemable shares · Company law · Stock purchase instructions · Technology firms · Digital share management · Electronic transactions · Shareholders · Financial impact · Legal frameworks

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1 Introduction

Under Article 68(e)(m) of the Companies Law, the Jordanian legislator has authorized private joint-stock companies to repurchase shares that they had previously issued. This provision allows private joint-stock companies to buy back their paid-up and subscribed shares, as long as their articles of association explicitly state this right [1].

The process of repurchasing shares by a company is similar to the process of redeeming shares. When shares are repurchased, they are known as "treasury stock," while shares obtained through redemption are referred to as "redeemable shares." In the Companies Law of Jordan, there is no clear distinction between these two processes, causing confusion in practice. However, the issuance of the Redeemable Shares Instructions for Private Joint-Stock Companies in 2020 introduced regulations to differentiate between repurchasing and redeeming shares. Nevertheless, Article 4(w) of these instructions allows companies to hold on to redeemed shares without specifying the duration, method, or fate of these shares after the holding period, if any [2]. This raises the following questions:

- Does the lack of a specified retention period for redeemed shares affect the company's continuity? Could it harm minority shareholders?
- Was the Jordanian legislator correct in not requiring the company to establish a special fund for redeemed shares? Should these shares be recorded as treasury stock?

In order to address these inquiries, it is essential to provide a clear understanding of treasury stock and differentiate them from redeemable shares, both of which will be thoroughly examined in the initial and subsequent sections of this chapter.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Identify similarities and differences between own shares and exchangeable shares from the point of view of company law.
- Research the financial and administrative implications of share repurchases and redemptions for the company and shareholders.
- Assess the adequacy of the relevant regulations regarding treasury stock and redeemable shares and identify any gaps and weaknesses.
- Provide recommendations to improve the legislative and regulatory framework to protect shareholder rights and increase fairness and transparency in share repurchase and redemption processes.
- Explain the legal and financial implications for shareholders of share repurchases and redemptions.

- Analyze the practical applications and procedures used by companies when repurchasing and redeeming shares and assess their compliance with applicable regulations.
- Increase understanding among companies and investors of the differences between treasury stock and redeemable shares and the importance of following legal procedures to ensure continuity and transparency of financial operations.

1.2 Study Methodology

To thoroughly examine the topic at hand, the study employs a method of comparative analysis. This involves scrutinizing various regulations pertaining to treasury stock and redeemable shares, including the Companies Law, the 2014 Stock Purchase Instructions, and the 2020 Redeemable Shares Instructions. By delving into these legal texts and regulatory decisions, the study aims to identify both the similarities and differences between these two processes. The focus lies on evaluating the financial and legal implications for both the company and its shareholders. In addition to this, the study draws upon existing legal and financial literature to gain insights into how these regulations are implemented in real-world scenarios. Based on the findings, the study puts forth recommendations for enhancing and refining the current legal frameworks. The ultimate goal is to safeguard shareholder rights and promote fairness and transparency in share repurchase and redemption procedures.

2 Concept of Treasury stock

Both public and private joint-stock companies in Jordan have been granted the authority to repurchase their previously issued shares, as addressed by the Jordanian legislator. However, specific regulations regarding the repurchase of "treasury stock" by public joint-stock companies have been established in the 2014 Treasury stock Instructions [3]. It is important to note that these instructions do not apply to the repurchase of shares by private joint-stock companies, unless these companies have listed their shares for trading on the financial market. The listing of shares for trading requires approval from the Securities Commission, in accordance with the conditions and instructions set forth by the commission. If approval is granted for the listing of private joint-stock company shares on the financial market, the repurchase of issued shares by these companies will be subject to the 2014 Treasury stock Instructions, as stated in Article 89(a)(m) of the Companies Law [4–9].

According to the 2014 Treasury stock Instructions in Article 2(a), treasury stock are officially defined by the Jordanian legislator as shares that are initially issued by the company and subsequently repurchased by the same company through the market. An alternative definition provided by certain legal scholars describes treasury stock as

shares acquired by the company, which are not canceled but rather held for potential future sale [10].

According to the researcher, treasury stock are defined as shares that shareholders subscribe to, but the company repurchases and holds in its own name. The purpose behind this repurchasing is to achieve the company's objectives and goals. One possible reason for issuing these treasury stock is to grant them to employees as an incentive to increase productivity and foster loyalty. However, when employees leave the company, the shares are repurchased since their original purpose no longer applies. Another objective of repurchasing shares is to prevent outsiders from becoming shareholders. If a shareholder wants to sell their shares to an outsider, the company may buy them back to maintain control. Additionally, repurchasing shares can be done to reduce profit distribution by decreasing the number of shareholders, as treasury stock do not receive dividends. These are just a few examples of the various goals that a company can achieve through repurchasing its issued shares [11–16].

The preservation of capital stability is of utmost importance, except in the case of a company repurchasing its own shares. During this process, it is crucial that the company does not tamper with its capital. As mentioned earlier, capital serves as the sole assurance for creditors. Furthermore, the legislator has granted permission for private joint-stock companies to repurchase solely the shares they have previously issued, excluding any other securities like bonds [4, 17]. Article 68(e)(m) explicitly limits the company's right to repurchase to shares alone, excluding any other securities issued by the company.

Private joint-stock companies follow a different process for repurchasing shares compared to public joint-stock companies. Unlike public companies, private companies do not need to adhere to the 2014 Treasury stock Instructions since their shares are not traded on the financial market. Instead, private companies can repurchase shares by obtaining a resolution from the extraordinary general assembly, as long as their articles of association grant them the right to do so. Once repurchased, these shares are recorded as treasury stock in the company's name, effectively removing the shareholder while keeping the capital unchanged [19–23].

According to the researcher, it is essential for the Jordanian legislator to clearly mention in Article 68(e)(m) that a company cannot buy back its issued shares unless they are listed on the financial market. This requirement ensures that the 2014 Treasury stock Instructions are applicable, which outline a series of regulations that must be followed during the share repurchase procedure.

It is crucial to implement and enforce controls regarding the company's repurchase of shares, specifically the non-voting treasury stock. The significance of these controls stems from the fact that treasury stock lack the ability to participate in voting or decision-making during general assemblies, which safeguards against any potential negative impact on minority shareholders by preventing their influence on company decisions. This reinforces the need to establish and maintain strict adherence to these controls [24–27].

The legal regulation of a company repurchasing its issued shares is of utmost importance as it has the potential to negatively impact the company, its shareholders, and creditors [28]. Recognizing the significance and potential risks involved, the

2014 Treasury stock Instructions established specific conditions and procedures to ensure that the process is conducted in accordance with the law.

2.1 General Conditions for a Company's Repurchase of Its Shares

2.1.1 Adherence to the Principle of Capital Stability

According to Article 4(b) [3, 29] of the 2014 Treasury stock Instructions, any shares repurchased by a company must be funded using retained earnings and optional reserves. This funding should not impact the company's capital, and the mandatory reserves (legal reserves) must remain untouched to ensure the security of creditors and maintain capital stability. It is important to note that Article 15 [3, 30] of these instructions provides an exemption for companies seeking to repurchase shares for the purpose of reducing their capital, allowing them to bypass the conditions outlined in the instructions. Therefore, the company has the option to finance the repurchase of treasury stock using a portion of its capital or mandatory reserves specifically for capital reduction [31].

2.1.2 Not Compelling Shareholders to Sell Their Shares

As per the 2014 Treasury stock Instructions [3, 32], specifically Article 5(a)(1), it is a fundamental principle of public order that shareholders have the right to retain their position within the company. This signifies that a shareholder cannot be compelled to exit the company through the repurchase of their shares without their explicit consent. The repurchase of shares necessitates the endorsement of the extraordinary general assembly [33].

2.1.3 Observing the Principle of Equality Among Shareholders

In order to maintain fairness and prevent any form of bias towards individual shareholders, Article 6 of the 2014 Treasury stock Instructions [3, 34] stipulates that the repurchase of company shares must be conducted exclusively through the financial market, with private transactions being strictly prohibited. Private transactions, which involve direct negotiations between the company and individual shareholders, can result in disparate compensation amounts for different shareholders. This creates the potential for preferential treatment, undermining the fundamental principle of equality among shareholders [35].

2.2 Formal Conditions for a Company's Repurchase of Its Shares

2.2.1 Issuance of a Purchase Decision by the Company

In accordance with Article 3 of the 2014 Treasury stock Instructions [3, 36], the board of directors of the company is required to make a decision and propose to the general assembly the repurchase of its issued shares. Subsequently, the extraordinary general assembly must approve this recommendation. The Securities Commission must be promptly notified of this decision, no later than the start of the next working day's trading session.

2.2.2 The Company Must Not Be Indebted Through Bonds

As per the guidelines outlined in Article 4(c) of the 2014 Treasury stock Instructions [3, 37], any company seeking to buy back its own shares must not have any outstanding bonds. In the event that the company does have bonds, it is presented with two alternatives: either repay the bonds or seek approval from an extraordinary general assembly to convert the bonds into shares. Furthermore, it is strictly prohibited for the company to fund the share repurchase through borrowing.

2.2.3 The Number of Shares to Be Repurchased Must Not Exceed 10% of the Total Issued Shares

To maintain the company's stability, ensure fair treatment of shareholders, protect minority shareholders from undue influence, and safeguard the interests of creditors, it is necessary to adhere to the guidelines outlined in Article 4(a) of the 2014 Treasury stock Instructions [3, 38]. These instructions stipulate that the repurchase of a company's shares should not exceed 10% of the total issued shares. It would be advisable for the Jordanian legislator to introduce regulations specifically addressing share repurchases by private joint-stock companies or to require these companies to incorporate the conditions and procedures outlined in the 2014 Treasury stock Instructions into their contracts and bylaws. By doing so, the company can ensure compliance with these guidelines when repurchasing its issued shares.

3 Distinguishing Treasury Stock from Redeemable Shares

To differentiate between a company's repurchase of its own shares and the redemption of shares by the company, it is crucial to analyze and understand the similarities and differences between treasury stock and redeemable shares.

Similarities between the Company's Repurchase of Its Shares (Treasury stock) and the Redemption of Shares (Redeemable Shares)

1. **Exceptional Transactions**: Both share repurchase and share redemption are exceptional transactions.
2. **Application to Company Shares**: Both processes apply to the company's shares during their lifecycle.
3. **Impact on Shareholder Status**: Both processes affect the shareholder's status by causing their exit from the company.
4. **Funding Sources**: The funding for these transactions is derived from profits and reserves, excluding capital or mandatory reserves. However, it should be noted that there is an exception when it comes to funding share redemption from capital, which is subject to certain conditions and limitations.

Fundamental Differences between the Company's Repurchase of Its Shares (Treasury Stock) and the Redemption of Shares (Redeemable Shares)

1. In the Companies Law of Jordan, Article (68/Repeated) contains two distinct paragraphs, (b) and (h), which address different aspects of share transactions. The legislator intentionally separates these processes into separate paragraphs to emphasize their individuality and to clarify that one process is not a variation of the other [39].
2. The guidelines for a company purchasing its own shares, referred to as "treasury stock," are mainly dictated by the Treasury stock Purchase Instructions established in 2014. On the other hand, the instructions for redeeming shares are outlined in the Redeemable Shares Instructions for Private Joint Stock Companies introduced in 2020.
3. According to the Treasury stock Purchase Instructions of 2014 [40], shareholders are not obligated to sell their shares when a company purchases its own shares. This process can only take place with the consent of the shareholder and the approval of the extraordinary general assembly [41]. In contrast, the redemption of shares, as outlined in the Redeemable Shares Instructions for Private Joint Stock Companies of 2020, can be initiated by the company, the shareholder, or under specific conditions stated in the company's bylaws [3, 42]. The authority to approve the redemption lies with either the general assembly or the board of directors [43]. Therefore, unlike share repurchases, the redemption process is not discretionary and is carried out in accordance with the company's bylaws as specified in these instructions.
4. When a company buys back its own shares, the shareholder is effectively removed from the company and the ownership of the shares is transferred to the company, resulting in "treasury stock." On the other hand, when shares are redeemed, the impact on the shareholder can go one of two ways: either the shareholder exits the company, which is the usual outcome, or the shareholder remains within the company, which is an exception. This exceptional scenario occurs when the company redeems the shares and, as part of the redemption process, may issue enjoyment shares to the shareholder whose shares were

redeemed [44]. As per Article (68/A/D/Repeated) of the Companies Law, the company has the unrestricted and absolute authority to issue different types and classes of shares [39, 45].

5. For a company to repurchase its issued shares, it must reach an agreed-upon purchase price with the shareholder. Conversely, the redemption of shares may or may not involve payment, depending on the provisions outlined in the company's bylaws. The company's bylaws must clearly define the method of calculating this payment and the manner in which it will be made, leaving no room for uncertainty [39].

   - In this regard, is there a specific limit or cap for the redemption payment? What are the consequences of not having such a limit?

   Based on the researcher's interpretation of Article (4/b) of the Treasury stock Purchase Instructions of 2014 [40], the company's allocation for the purchase of its own shares must not surpass the retained earnings, achieved profits, and other reserves, excluding mandatory reserves. Adjustments for issue discounts and negative fair value adjustments on financial assets included in other comprehensive income should also be taken into account. It is crucial to note that there is a limit or cap imposed on the acquisition of treasury stock, which must not be exceeded. However, the 2020 Redemption Shares Instructions for Private Shareholding Companies [41] do not specify a specific limit or cap for the redemption payment in cash. This poses a significant risk as it allows the company to redeem redeemable shares at a cash amount determined solely by the company, without considering the interests of the shareholders. Such a practice could potentially harm shareholders who have invested in redeemable shares. For instance, if a company redeems 10,000 redeemable shares for 1,000 dinars, it would violate the principles of fairness and partnership, which are fundamental to the concept of a company as outlined in Article (582) of the Jordanian Civil Code [3, 42].
6. According to the Treasury stock Purchase Instructions of 2014 [3, 43], when a company chooses to repurchase its own shares, it should do so at the market value of the shares. Ideally, this repurchase would take place through the financial market. On the contrary, the redemption of shares does not involve the financial market. Instead, shareholders directly redeem the value of their shares from the company. The redemption can be done at face value or at the agreed value stated in the company's bylaws for the redeemed shares [3, 44].
7. When a company repurchases its own shares, the shares are transferred from the shareholder to the company and are referred to as "treasury stock." These shares do not possess the entitlement to receive dividends that are distributed by the company to its shareholders. Additionally, they are not allowed to participate or vote in the company's general assembly meetings, nor are they eligible for representation on the board of directors, as stated in Article (8) of the Treasury stock Purchase Instructions of 2014 [2, 45]. However, there is an exception to this rule. If the redemption of shares does not result in the shareholder severing ties with the company, then this shareholder will retain the rights outlined in the

company's bylaws. This includes the ability to receive dividends and partake in and vote at the company's general assembly meetings [3, 39, 46].

8. When a company engages in the repurchase of its own shares, it must ensure fairness to all shareholders by acquiring the shares through the financial market, as previously mentioned. Transactions with individual shareholders are strictly prohibited, as outlined in Article (6/d) of the Treasury stock Purchase Instructions of 2014 [47]. On the other hand, when it comes to share redemption, a private shareholding company has the discretion to issue redeemable shares to certain shareholders while excluding others. Shareholders who choose to redeem their shares receive compensation during the company's ongoing operations, while the remaining shareholders can only receive compensation for their shares upon the company's dissolution, specifically during the liquidation process. Consequently, there exists an inherent inequality between redeeming shareholders and other shareholders [35, 48].
9. According to Article (4/a) of the Treasury stock Purchase Instructions of 2014 [49], it is imperative for a company to ensure that the quantity of shares it plans to repurchase does not surpass 10% of the subscribed shares. Conversely, the Redemption Shares Instructions for Private Shareholding Companies of 2020 [5] do not establish any specific cap on the proportion of redeemable shares in relation to the total shares of the company.
10. As stated in Article (4/b) of the 2014 Treasury stock Purchase Instructions [6], a company can utilize retained earnings, achieved profits, and other reserves (excluding mandatory reserves) as sources of funding for purchasing its own shares. In the case of redemption, the funding can come from the balance of distributable profits, optional reserves, redemption reserves, and issue premium. If these sources are depleted, the company may resort to obtaining funding from its capital, as previously mentioned [7].
11. After a company repurchases its own shares, they are referred to as "treasury stock" and are held by the company. However, in accordance with Article (9) of the Treasury stock Purchase Instructions of 2014, the company is required to retain these shares for a minimum of six months from the date of purchase, but no longer than eighteen months from that same date [46]. The company is obligated to sell the treasury stock within the timeframe specified in Article (9) of the instructions. If the company fails to sell the treasury stock, it must dispose of them by either reducing the capital with the remaining treasury stock or distributing them to the company's shareholders. The procedures and conditions for this disposal are outlined in Article (13) of the same instructions. In the event that the company wishes to extend the holding period, it must seek approval from the Securities Commission.

According to Article (4/w) of the 2020 Redemption Shares Instructions for Private Shareholding Companies [8], the company's bylaws must address what happens to shares after redemption. This can include reissuing and selling them, canceling them and reducing the company's capital, or retaining them. However, these instructions do not specify how long the company should retain the redeemed shares or what

should be done with them after that period, if there is one. The researcher suggests that the legislator should have established a timeframe for holding onto redeemed shares and provided guidance on what to do with them once that period ends, as outlined in the Treasury stock Purchase Instructions of 2014. This would ensure the company's continuity.

4 Conclusion

In terms of their legal and financial implications for the company and its shareholders, the study found notable distinctions between the procedures involved in a company repurchasing its own shares (treasury stock) and the redemption of redeemable shares. The study highlighted the importance of enhancing Jordanian legislation pertaining to both treasury stock and redeemable shares to prevent any overlap and safeguard the rights of shareholders.

4.1 Results

The study reached the following results:

- The laws clearly differentiate between treasury stock and redeemable shares, highlighting the distinct financial and legal implications associated with each type.
- When shares are repurchased, it results in the shareholder permanently exiting the company, while the shareholder whose shares are redeemed may still have the opportunity to remain within the company, provided certain conditions are met.
- When it comes to financing the procedures of repurchasing shares and redeeming them, there are distinct differences between the two methods. The former relies on retained earnings and reserves, whereas the latter can be funded through capital in exceptional circumstances.
- While the buyback of shares is conducted at market value, the redemption of shares can be executed either at face value or at a value that is mutually agreed upon as per the company's bylaws.

4.2 Recommendations

Based on the results obtained, the study recommends the following:

- Develop Jordanian legislation specifying the length of time a company should retain redeemed shares and clarifying their fate after that period.

- Create a special fund for redeemed shares to avoid confusion between treasury stock and shares subject to repurchase.
- Set clear limits and caps on redemption payments to protect shareholder rights and ensure fair dealings with all shareholders.
- Encourage companies to increase the transparency of share repurchase and redemption processes by fully disclosing the conditions and procedures associated with these operations.

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The Impact of Learning Platforms Technologies on Student Motivation and Engagement: A Psychological Perspective



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Abstract The merger of learning platform technologies with education has metamorphosed the typical learning situation, and this can be vividly seen in the time of Covid-19 where digital platforms were more than just necessary. This paper explores the psychological dimensions through which technology affects student motivation and engagement, providing an in-depth analysis from the perspective of Self-determination Theory. The research is steered towards intrinsic motivation as a fundamental determinant for students' self-driven involvement and sustained interest in educational activities and how the trait is affected by using digital learning platforms. Taking a qualitative research approach, the current study undertakes a systematic literature review on how different components of Self-determination Theory—such as autonomy, competence, relatedness—affect or are related to student engagement within virtual learning environments. It reflects that digital platforms create a significant impact on students' perceptions regarding their experiences throughout the learning process in terms of its meaningfulness and manageability, discussion drawn from studies among Indonesian EFL learners. Moreover, the research identifies patterns and themes that only serve to underscore the entanglement between learning technologies and such psychological variables as motivation and engagement. The findings stress that a well-informed analysis of such interactions—more particularly in regard to diverse student demographics in terms of age and academic performance—is what is really needed. It recommended areas for further research, implying that ongoing exploration into the psychological impacts of educational platforms will be important for fine-tuning educational practices to improve student outcomes in a digital world.

Keywords Student motivation · Student engagement · Psychological perspective · Digital learning · E-learning technologies · Virtual classrooms · Covid-19 pandemic

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1 Introduction

This essay's introduction regarding the effects of learning platform technologies on student motivation and engagement offers a crucial overview of the topic's significance while aiming to engage the reader's attention. It acts as a guide for the following sections, outlining the primary themes that will be discussed. The exploration will focus on students' intrinsic motivation when utilizing digital learning platforms, especially during the Covid-19 pandemic, and how e-learning technologies and remote classrooms enhance student engagement. To analyze the autonomy, competence, and sense of belonging that affect student involvement in virtual learning, the framework of Self-determination Theory will be utilized [1, 2].

The notion of intrinsic motivation will be considered within Self-determination Theory which underlines the importance of autonomy, enjoyment, and meaningful participation in learning activities. The impact of digital education platforms during the pandemic has a considerable effect on perceptual students as well as efficacy in learning and productivity in language, as evidenced by the positive perceptions of Indonesian EFL learners.

1.1 Background and Rationale

The development of learning platform technologies over time has psychological implications for student motivation and engagement [3, 4]. In the Self-determination Theory, it is stated that intrinsic motivation is important for student participation in digital learning platforms. In the research study related to the use of these platforms during the pandemic period, it was found that intrinsic motivation itself, as an independent variable together with autonomy and enjoyment, contributed to increased engagement and satisfaction of learners in a second language [1]. Similarly, another study based on Self-determination Theory on student engagement in virtual learning considered that e-learning technologies and remote classrooms can increase student motivation by providing competence as well as belonging autonomy gleaned from [2].

The results draw attention to the need for an understanding of historical context and rationale on which grounds technologies of the learning platform affect motivation and engagement of students, thus providing valued perspectives on changes landscapes of EdTech and their psychological implications.

1.2 Research Aim and Objectives

The study seeks to investigate the impact of learning platform technologies on student motivation and engagement from a psychological perspective and, thereby,

set specific research objectives during the primary aim to probe how such technologies would influence student behavior, cognitive development, and learning styles as well as their overall commitment within the educational process. The main idea that these will convey is a clear description of how the learning platforms affect student motivation and engagement, which is what is being done by setting specific research objectives.

Warren's study on behavioral objectives highlights the need for telling the students what they are going to learn explicitly so as to enhance their performance and engagement [2]. The research emphasizes that instructional objectives are vital in delineating measurable learning outcomes and, as a result, effective teaching. Consistent with this view, the present study is an attempt to investigate how educational platforms can effectively communicate instructional objectives to have positive effects on student motivation and involvement.

1.3 Methodology

This chapter "The Impact of Learning Platforms Technologies on Student Motivation and Engagement: A Psychological Perspective" is qualitative in nature and aims at an in-depth analysis of how various learning platform technologies affect student motivation and engagement. Adopting a descriptive approach, the present study carries out a systematic review of the available literature to provide an understanding regarding research already undertaken in this field. Through the analysis of patterns and themes ascertained within the literature, the study applies itself to an analytical approach for the critical examination and synthesis of findings. This aids in generating informed insights and discussions about psychological impacts due to learning platforms on student behavior, hence adding some minor details that have not been brought to light regarding technology in education for the enhancement of student engagement.

2 Understanding Student Motivation and Engagement

Both motivation and engagement of students constitute very important basic elements in the learning process, especially within digital learning platforms. One of the major issues that stimulate active participation in learning is intrinsic motivation. Autonomy, competence and relatedness are described in the Self-determination Theory as factors of intrinsic motivation: as mentioned by [2], it involves autonomy, competence, and relatedness as outlined in the SDT resulting from the performance itself, ongoing involvement for its own sake. The SDT framework underlines autonomy, competence and relatedness as sources to boost student engagement [5]. This theoretical basis provides valuable insights into psychological aspects that

influence the motivation of students and continuous involvement during an educational journey; thus, it sheds light on ways technologies on learning platforms impact student engagement and productivity.

2.1 Theoretical Frameworks

Student motivation and engagement within learning platform technologies are key to theoretical frames. An enlightening framework is the Self-Determination Theory concerning the factors that initiate learner participation in e-setting education. The SDT emphasizes the importance of autonomy, belongingness, and competence for stimulating student involvement, as cited in [6]. Such a model helps educators and researchers understand the impact that e-learning technologies and remote classrooms have on student motivation and engagement, thus shaping the development and implementation of effective learning platforms.

One more key theoretical foundation is the concept of psychological capital, originating from positive psychology. The positive relationship between psychological capital and academic performance is reviewed by [7], underlining its importance in building engagement of students in their learning. Understanding these theoretical frameworks is important in the relationships between student motivation, engagement, and learning technologies of the platform.

2.2 Key Concepts and Definitions

In the analysis of how e-learning platform technologies impact student motivation and engagement, the core concepts and constructs under study must be clarified. Psychological capital as a concept arising from positive psychology that describes an individual's positive developmental psychological state has proven to positively correlate with student engagement in learning, thus contributing to increased academic performance in blended learning environments []. Furthermore, it is both intrinsic and extrinsic motivation that act as notable factors known to correlate positively with the outcomes of learning; intrinsic motivation, however, plays a major role in influencing blended learning settings. According to Self-Determination Theory (SDT), students' engagement in virtual learning is related to the three fundamental needs when they learn: competence, belongingness and autonomy, all of which are influenced by the application of technologies in e-learning and remote classrooms [8].

These concepts and definitions lay the groundwork for grasping the psychological elements of student motivation and engagement, highlighting the factors affected by the utilization of learning platform technologies.

3 Learning Platforms Technologies

Technologies for learning platforms comprise a diverse array of systems and tools employed in educational environments to facilitate student learning. This category includes mobile handheld devices, virtual learning environments, and educational games, all specifically crafted to engage and inspire students throughout their educational journey. For example, educational games are structured to present learning content through the most engaging aspects of gameplay, in line with motivational frameworks like Eccles and Wigfield's Expectancy-Value theory and the Self-Determination theory. Furthermore, the incorporation of technology in language learning courses has been shown to foster task-based instruction, social interaction, and active learning, which collectively enhance student motivation and involvement [9].

The significance of these technologies lies in their ability to offer extrinsic motivation that can ignite students' intrinsic motivation, a concept highlighted by Bruner's focus on the necessity of structure and motivation within the learning process. Educators can effectively utilize these learning platform technologies by recognizing their motivational affordances, thereby boosting student engagement and motivation in educational environments.

3.1 Types and Features

Digital learning platforms consist of a broad spectrum of technologies that support different forms of education—online, classroom, and blended learning. These platforms can be represented by Learning Management Systems (LMS), Learning Content Management Systems (LCMS), virtual classroom applications, or Virtual Learning Environments (VLE) [9]. For example, in a study concerning second language learners during the time of the pandemic of Covid-19, digital learning platforms featured tools like Canva and Google Drawing for creative tasks, Google Docs for writing and editing work, and the LinkedIn social network for career development and professional practice in terms of job opportunities. Therefore, peer interaction based on these platforms may enhance autonomy as well as engagement feelings among students since faith has been reported on how much they got involved with saw themselves learn virtually [10].

These platforms play a big part in building students' motivation that comes from within and psychological needs by increasing students' feelings of how capable they are, that they belong and their autonomy. The perceptions students have about their competence, feelings of belonging and sense of autonomy are shaped by different factors with the availability of academic support, acceptance from peers plus teachers and the ability to take control over own learning.

3.2 Advantages and Limitations

In educational environments, technologies designed for learning platforms present numerous benefits. They serve as an efficient method for students to engage in enriched thinking, research, and presentation [11]. Computer-Mediated Communication (CMC) acts as a facilitator in education, incorporating interpretive, interpersonal, and presentational modes, which fosters a social interaction language environment among peers and aids learners in knowledge construction. Additionally, integrating technology into language learning settings has been shown to boost student motivation and excitement, shifting the focus from traditional teacher-centered classrooms to more learner-centered approaches.

It is essential to acknowledge the constraints associated with learning platform technologies. Although digital learning platforms have demonstrated a positive effect on student engagement and motivation, especially during the Covid-19 pandemic [12], it is vital to understand that intrinsic motivation—key for ongoing engagement—is shaped by multiple factors, including age and academic performance in the subject. Consequently, while technology can boost motivation and productivity, educators must remain aware of the complex nature of student motivation and the possible shortcomings of technology in comprehensively addressing all dimensions of motivation and engagement within educational environments.

4 The Interplay Between Technology and Psychology

The relationship between technology and psychology within education is complex, involving various cognitive and behavioral influences on learners. Research conducted by Brayshaw and Gordon highlights the motivational elements inherent in gaming dynamics that have the potential to enhance student engagement in learning activities [12]. This study examines how game players perceive their experiences, the motivational framework employed by game designers, the significance of social interactions, and psychological theories related to motivation. Utilizing Self-Determination Theory, the research informs the design of interactions and dialogues by concentrating on both intrinsic and extrinsic motivation sources, learner ownership of their education, self-autonomy, and the communal aspect of learning. Furthermore, it was underscored by [13] the influence of digital educational games on students' motivation to learn, pointing out the mediating role of learning engagement and the moderating influence of the digital environment. The engaging and challenging characteristics of digital games promote student involvement, motivating them to dedicate time and effort to problem-solving and completing tasks, which ultimately results in increased motivation and a sustained active approach to learning.

These research efforts highlight the importance of technology in influencing student motivation and engagement, providing valuable perspectives on how motivational theories can be applied in the educational environment [14].

4.1 Cognitive and Behavioral Effects

The games encourage positive learning support by providing a virtual environment that is interesting to the students and increases engagement in educational tasks with the opportunity to address or solve problems. These digital educational games are very engaging and meaningful due to their immersive and interactive nature—such as role-playing, problem-solving, collaboration—and they make learners really feel involved. In addition, these games give feedback instantaneously from the actions or performance of students based on understanding progress so that learners can realize meaningfully created workable plans for strategies of improving them all times. Emotional responses elicited by digital educational games help further boost participants' sense of engagement, which activates more effort into information processing; this makes them even more motivated to learn.

These findings reveal the effects of digital educational games on students' cognitive and behavioral dimensions, underlining the importance of interactive and immersive learning experiences in increasing student motivation and engagement [14].

4.2 Motivational Theories

Motivation and engagement of students in technology-mediated learning environments are major issues in the field of educational psychology. Numerous motivational theories have contributed to research on the Self-Determination Theory (SDT). It was recognized by [15] that three basic needs for active student participation in the teaching-learning process within an autonomy support climate: autonomy, relatedness, and competence. This makes a critical contribution by providing perspectives on how educators can motivate students to take part in collaborative online learning and how e-learning technologies and remote classrooms can foster student involvement from an SDT perspective. On the other hand, Behaviorist Theory models show that motivation is significantly affected by the presence of digital surroundings which act as moderators as well as through mediating effects played via different dimensions belonging under engagement level where educational games come significantly impact students' motivation, initiative interest with skills thus driving sustained engaged actively during their learning journey [15]

5 Implications for Educational Practice

The convergence of psychological factors and e-learning platforms has big implications for educational practices. Pedagogical strategies can, by focusing on intrinsic motivation and interest in learning, use technology to increase student motivation

and involvement. Intrinsic motivation, according to Self-determination Theory, is the type of drive that leads an individual to engage in an activity purely because of interest, enjoyment, or satisfaction felt within [15]. For example, digital educational games play a crucial role in creating a favorable learning environment for students and also getting them more engaged in the learning process [16]. They generate a virtual context that attracts students toward learning and increases their participation in educational tasks while providing instant feedback plus inducing favorable emotional responses—hence boosting commitment to the activity with features designed to provide immediate rewards and create positive emotional experiences while maintaining engagement.

5.1 Pedagogical Strategies

In using technology-based learning platforms, be it virtual or not, involving pedagogical strategies is quite important for the enhancement of student motivation and engagement. According to [16], one has to communicate with instructors and peers, use relevant learning resources, incorporate interactive activities, and create social bonds between learners and instructors to ensure that adopted approaches work effectively in improving learner engagement within synchronous online learning settings. The contribution of the research conducted by [17] underscores instructional designs related to the Self-Determination Theory (SDT) framework that emphasize competence, belongingness, and autonomy. This provides a valuable way of understanding how e-learning technologies can drive student engagement in remote classrooms to give implementers useful strategies for enhancing student motivation and involvement through proper pedagogical methods.

5.2 Professional Development

The professional development is key in providing educators with necessary skills and knowledge to engage with learning platform technologies effectively. Edmodo, acknowledged as a social learning network platform, is a resourceful tool for enhancing the professional development of teachers that have the option of accessing it at any time and from any device. For those working in English as a Foreign Language (EFL) classrooms, technology-driven professional development programs seek to improve classroom management for these teachers while maintaining a positive attitude toward ongoing training [18]. Technology has been considered very useful in the field of education since it helps educators create more meaningful learning experiences for all students; this, in turn, helps to improve the quality of teaching English and other subjects. In summation, ongoing professional development and training is what helps bring about optimal integration of technology within

educational practices which will eventually lead to enhanced student motivation and engagement [19].

6 Challenges and Future Directions

The merger of learning platform technologies is a complex problem and future work toward integration that needs to be shared from both the ethical and technological dimensions. Effective blended learning integration requires explicit pedagogical planning to ensure a complement of online instruction with any face-to-face (F2F) teaching and that they are also fn1_seamlessly interconnected [19]. The transition also shift from the old methods fn2_involves ways of teaching towards integrating new online instructional components that must be carefully considered and fully re-evaluated through the redesigning process. This underlines the importance for technology to be integrated into the pedagogical framework where meaningful learning activities play a major role in this integration between both F2F and online components [19]. Besides, it is important to take into account motivations rigorously when applying theories in designing educational technologies [19]. They call for integrating well-established motivational theories such as Eccles and Wigfield's Expectancy-Value Theory and Self-Determination Theory in informing the development of virtual learning environments. Such an approach will ensure that how educational technology is designed helps to elicit student interest and motivation, especially in such field as Science, Technology, Engineering, and Mathematics (STEM) With continual developments within the edtech landscape it is imperative to consider these theoretical underpinnings with the motivational opportunities new technologies afford to address challenges which would impact future pathways in student engagement and motivation.

6.1 Ethical Considerations

The use of learning platform technologies in educational contexts is very important and needs to be based on ethical considerations. To address the ethical dilemmas and concerns that may arise, leading to possible negative implications, it is important that these tools are used responsibly and thoughtfully. As mentioned by [20], professional organizations need to balance various interests involved in choosing or developing educational technologies while also safeguarding educational purposes. This underscores the need for a substantial shift toward a culture of professionalism within the edtech industry to handle its ethical dimensions properly. In addition, taking into account quality assurance and best practices in international distance education will help solve ethical issues, primarily through ensuring accessibility and reducing associated risks with emerging technologies.

As noted by [20], intrinsic motivation is a cornerstone of digital learning platforms. The importance of understanding the intrinsic motivation of students was redoubled during the Coronavirus disease 2019 (Covid-19) pandemic, so as to highlight ethical implications of using technology for enhancing motivation and engagement in educational contexts. This research underscores that autonomy, enjoyment, and fulfillment of learners should be taken into account when using digital learning platforms—thus shedding light on ethics related to the promotion of intrinsic motivation in educational technology applications.

6.2 Emerging Technologies

The rise of new technologies in the teaching environment is revolutionizing education and holds great promise to increase student motivation and involvement. In the context of such innovations as e-learning platforms and remote classroom technologies, the possibilities for reshaping learning experiences are feasible. It was explored by [20] how e-learning and remote classroom technology can drive student engagement. It was revealed from their findings that among other factors competence, relatedness, autonomy has a significant impact on students' engagement in models of online learning; this is in line with Self-determination Theory (SDT) framework. Moreover, another important factor is the impact of technology integration into education on student motivation which was found to be very favorable especially for language learning courses [21]. The research proved that there is a relationship between technology use and student motivation; therefore, it can be thought that applying technology within language teaching methodologies will help foster students' interest [22].

The above observations underscore the potential of new technologies in increasing student motivation and engagement, thereby offering significant insights for future developments in the sphere of educational technology.

7 Conclusion

In other words, the effect of learning platform technologies on student motivation and engagement is a complex issue from the psychological perspective. This chapter presents the intricate interplay of psychological factors that act upon motivation and engagement of students in relation to learning platform technologies; it underscores the need for more empirical studies to further understand these relationships and their implications for educational practices. Indeed, insight into intrinsic motivation in digital learning environments, which is contingent upon factors such as age and academic performance, could greatly help improve student engagement as well as academic achievements. The recommendations for future research serve as a stimulant for more exploration and investigation into the dynamic relationship between

learning platform technologies and student motivation and engagement from the psychological perspective. The identified potential areas that require further study and advancement will contribute to an enhanced comprehension of how learning platforms influence student motivation and engagement.

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Protection of Geographical Indications in the Digital Transformation Era: A Comparative Legal Study of International Legislation



Omar Al Makhzoumi and Salma Fathy Abdel Qader Abdel Halim

Abstract Within a comparative legal framework, this study aims to evaluate the influence of geographical indications on safeguarding local products and enhancing their quality and safety. The focus is on how technology can reinforce this protection. The examination delves into the role of geographical indications in upholding the rights of local producers and bolstering their competitiveness. Furthermore, it explores how digital transformation and modern technologies, such as blockchain and artificial intelligence, can contribute to and enhance the safeguarding of these indications. The study also addresses the legal and legislative obstacles associated with implementing geographical indications in the digital realm. Multiple legal frameworks are reviewed and compared to international standards. Utilizing an analytical and critical approach, the study emphasizes the necessity of improving legislation concerning geographical indications to ensure comprehensive and effective protection in the digital environment, benefiting both producers and consumers. The study concludes that there is an immediate need to develop legal frameworks that enhance the efficacy of geographical indication protection in the context of digital transformation. Additionally, raising awareness among producers and consumers about the significance of these indications is crucial. The study recommends strengthening international cooperation and providing additional support for research and development in this field to improve protection effectiveness and enhance the economic competitiveness of local products in the digital market.

Keywords Geographical indications · Local product protection · Legal legislation · Comparative legal frameworks · Producer rights · Product quality · International legislation · Digital transformation · Modern technology · Blockchain · Artificial intelligence

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1 Introduction

In the realm of commerce, geographical indications (GIs) play a vital role as a form of intellectual property, commonly associated with agricultural goods. However, their significance extends beyond just agriculture, impacting various sectors of industry and economy. Article 21 of the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) acknowledges the importance of GIs. These indications have long been recognized as traditional components of industrial property, initially referred to as "indications of source" and "appellations of origin" or "certificates of origin" under the Paris Convention of 1883. They serve as rights that designate the origin of both industrial and agricultural products.

The momentum to enhance safeguards for geographical indications persisted after the Paris Convention, exemplified by the enactment of the Madrid Agreement for the Prevention of False or Misleading Indications of Source and the Lisbon Agreement for the Protection of Appellations of Origin and their International Registration (1958). These advancements reached their pinnacle with the incorporation of geographical indications into the TRIPS Agreement.

Broadly speaking, a geographical indication is a symbol affixed to a product that signifies its exceptional quality or esteemed reputation associated with a particular source. This source, which is typically a specific geographic location, establishes the product's distinctive attributes, reputation, and excellence. Examples of such indications include names like "Karak Jameed," "Nablus Soap," "Aleppo Pistachio," or "Jarash Labneh," which serve as markers of the strong link between the product and its geographical origin.

Although geographical indications are typically associated with agricultural goods, their application has broadened to encompass other industries. The purpose of utilizing a geographical indication is to emphasize distinct characteristics of a product that can be attributed to various factors, which will be thoroughly explored in the research. It is important to mention that the Geographical Indications Law No. 8 of 2000 was implemented by the Jordanian legislature, and this legislation will also be analyzed in the study.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Establish clear and specific criteria to distinguish geographical indications from other elements of industrial property, such as trademarks and trade names, in order to understand the nature of each and the differences between them.
- Determine who has the rights to the GI—whether it is the state or individuals, and explain the conditions for granting the GI, registration and appeals procedures.

- Assess the adequacy of Jordan's legislation on the regulation of geographical indications, identify its weaknesses and shortcomings, and offer suggestions for improvement.
- Provide guidance to address issues related to GIs and increase awareness of their importance and how to effectively protect them.

1.2 Study Methodology

In order to study and analyze legal and legislative texts pertaining to geographical indications, this research employs a descriptive-analytical methodology, which is deemed the most appropriate approach. The descriptive component aims to provide a thorough examination and assessment of the existing legislation and laws governing geographical indications, facilitating the identification of both strengths and weaknesses in the current legal framework. On the other hand, the analytical aspect involves a comprehensive breakdown and examination of legal texts to comprehend the regulations and application of geographical indications, as well as to identify any deficiencies in Jordanian legislation in comparison to international standards. This methodology was selected due to its ability to establish a solid basis for an intricate and precise analysis of legal texts, enabling the researchers to propose practical recommendations for enhancing the legal framework concerning geographical indications, based on a comprehensive understanding of current legal provisions and practices.

1.3 Study Problem

The lack of clarity surrounding geographical indications in Jordanian legislation is the primary concern of this study. The challenge lies in defining the legal nature of geographical indications and distinguishing them from other elements of industrial property, such as trademarks. The deficiencies are evident in the Jordanian Geographical Indications Law No. 8 of 2000, which lacks detailed and effective provisions for protecting geographical indications and suffers from ambiguity in its regulations and applications. These fundamental issues, including the unclear relationship between geographical indications and trademarks, and the need for clear conditions and procedures for granting and registering geographical indications, form the core of the study problem. Therefore, a thorough examination of the current legislation is necessary to determine its adequacy and make improvements that ensure comprehensive and effective protection of geographical indications. Thus, the study problem revolves around answering the following key questions:

1. What is a geographical indication, what is its legal nature, how does it relate to trademarks and trade names, and what is the state's role concerning it?

2. Has the Jordanian legislation on geographical indications adequately regulated and detailed its provisions, and what are its weaknesses and flaws?

2 Concept of Geographical Indications

Extensive research and scholarly analysis on geographical indications have been lacking. The existing definitions of geographical indications, as outlined in international agreements, have been widely accepted without much interpretation or specialized explanation. However, Dr. Samihah Al-Qalyoubi has provided a comprehensive definition, stating that a geographical indication refers to the identification of a product's origin from a specific region or area within a WTO member country or a nation with reciprocal treatment with Egypt. Furthermore, the quality, reputation, or distinctive characteristics of the product must primarily stem from its geographical origin in order to influence its promotion [1].

While it is accurate to state that the responsibility of defining terms does not fall under the jurisdiction of legislators, but rather legal scholars, we have come across a definition of a geographical indication provided by Dr. Samihah that closely corresponds to the definition outlined in Article (104/1) of the Egyptian Intellectual Property Protection Law No. 82/2002, as stated in the initial chapter of the second book.

In addition, she provided a definition for geographical indication that emphasized its characteristics and its role in identifying the quality and characteristics of a product. On the other hand, Professor Dr. Nouri Hamad Khater defined geographical indications as names associated with products that distinguish them from others by indicating their quality and origin to the public. It is worth noting that he drew a connection between geographical indications and trademarks in terms of distinguishing goods. However, the researcher may have conflated geographical indications with trademarks, as the primary function of a trademark is to differentiate products based on their quality, not that of a geographical indication. Furthermore, he did not specify the specific types of products that can bear a geographical indication.

2.1 Concept of Geographical Indications in Legislation

The historical practice of identifying goods by their place of origin dates back to ancient times, but the term "geographical indications" did not gain international recognition until the 19th century. In the following section, we will explore the evolution of geographical indications in international agreements throughout history.

The concept of geographical indications made its debut in international agreements during the year 1883 within the Paris Convention, where it was referred to as "Appellations of Origin." Article 1, paragraph two of this convention explicitly states that the safeguarding of industrial property encompasses various elements, including

patents, utility models, industrial designs, trademarks, service marks, trade names, indications of source, and appellations of origin [2]. However, it is important to note that the convention did not delve into the specifics or provide a definition for "Appellations of Origin." Instead, it merely acknowledged their inclusion within the realm of legal protection. Consequently, without a comprehensive understanding of the nature of an appellation of origin, it becomes challenging to apply the text of the aforementioned article in a manner that accurately identifies and categorizes it as such.

It was not until 1891 that a resolution was reached to address this ongoing issue. The Madrid Agreement for the Repression of False or Deceptive Indications of Source on Goods was established during this time. According to this agreement, any products that falsely claim their origin, whether by directly or indirectly referencing a member country or a specific region within it, would be confiscated upon importation in any of the countries involved. Furthermore, the country where the false indication of origin originated would also take action. In cases where there are no specific penalties for suppressing false indications of the source of goods, the existing laws governing trade names and trademarks would be enforced [3].

The year 1958 saw the establishment of the Lisbon Agreement for the Protection of Appellations of Origin and their International Registration (official name to be verified). This agreement provided a precise definition of "Appellation of Origin" as the "geographical name of a country, region, or locality, which serves to designate a product originating therein" [4]. However, this definition solely focused on identifying the product's geographical origin and did not take into account factors such as quality, type, or reputation. Furthermore, it mandated that the appellation of origin must be a geographical name, thereby excluding symbols, signs, and indicators from receiving protection under this agreement.

Concept of Geographical Indications in Comparative Legislation

When examining the definitions of geographical indications in various national and international laws, it becomes evident that the majority of them have not surpassed the concept outlined in the TRIPS Agreement, as this was the initial agreement to address this term. In the Geographical Indications Protection Law No. 40/2000 of 2000 in Oman, Article 1 provides a definition of a geographical indication as "any indication that identifies a product as originating from a specific place or environment in any country, region, or location, due to natural and human factors, or a combination of both" [5]. The legislator in Oman successfully expanded upon the factors that contribute to the characteristics of a geographical indication, encompassing both natural and human elements.

According to the Jordanian legislator, geographical indications are defined as indicators that specify the origin of a product within a particular country or region, with the product's quality, reputation, or other characteristics being closely tied to that specific origin [6]. The Geographical Indications Law in Jordan was implemented for various reasons, starting with the initial negotiations held with the World Trade Organization in 1996. During these negotiations, a detailed memorandum was presented, outlining the economic and commercial situation in Jordan. Subsequent

bilateral meetings with the United States focused primarily on concerns regarding intellectual property rights violations in the Jordanian pharmaceutical sector. On December 17, 1999, Jordan officially announced its membership in the World Trade Organization during the World Trade Conference. As part of this membership, Jordan had to comply with the TRIPS Agreement, which took effect on April 11, 2000 [7]. Consequently, legislation was necessary to fulfill the requirements of this agreement, leading to its issuance in the same year. However, it remains unclear whether this legislation underwent a thorough study and examination before being made public.

According to the Bahraini legislator, a geographical indication is defined as any indication that serves to identify a product as originating from a specific territory within a member country of the World Trade Organization. This indication is crucial in determining that the quality, reputation, or other distinguishing features of the product can be primarily attributed to its geographical origin. The form of a geographical indication may vary, encompassing signs or combinations of signs, whether they be in the form of words (including geographical or personal names), letters, numbers, figurative elements, or colors [8].

Geographical indications, as defined by the Egyptian legislator, refer to the identification of a product's origin in a specific region or location within a member country of the World Trade Organization or in a country that has reciprocal treatment with the Arab Republic of Egypt. The quality, reputation, and other distinctive characteristics of the product, which play a significant role in its promotion, are primarily attributed to its geographical origin. To ensure the protection of these indications, it is necessary for them to have obtained legal protection in their country of origin [9].

According to Moroccan legislation, the concept of indication of source is described as the utilization of a term or symbol to signify the origin of products or services, whether it be a country, group of countries, region, or specific location [10]. Similarly, the legislation defines the appellation of origin as the geographical name of a country, region, or locality that is used to identify a product originating from that specific area. This product is distinguished by its exclusive or essential association with the geographical environment, encompassing both natural and human factors, which contribute to its quality, reputation, or other distinctive characteristics [11].

It has been observed by the researchers that all Arab legislations are in alignment with the TRIPS Agreement. This is due to the fact that countries that have become members of the World Trade Organization have made necessary amendments or introduced new legislation to ensure compliance with the TRIPS Agreement, in accordance with the general principle that international agreements take precedence over national laws. Furthermore, based on the definitions provided earlier, the researchers conclude that a geographical indication is linked to a specific region within a particular country, and the product associated with this indication possesses distinctive characteristics that set it apart from similar goods, thereby increasing its popularity. However, this leads to the question of whether the state that owns the region has any inherent connection to it.

The interpretation of the term "product" in relation to geographical indications raises a crucial question: does it encompass goods, services, or both? Comparative

legislation [12] indicates that legislators typically associate geographical indications with goods, aligning with the provisions of the TRIPS Agreement. According to Article 22 of the TRIPS Agreement, WTO member states are obligated to protect geographical indications for goods, but not services. Consequently, the term "product" is understood to refer specifically to goods in the context of international intellectual property protection law. This approach has been adopted by WTO member states, making it evident that the Jordanian legislator made an error by using the term "product" instead of "goods" in Article 2 of the Jordanian Geographical Indications Law. It is essential to discern the legislator's intent behind this terminology. Did they intend for "product" to encompass both goods and services?

The lack of specification or clarification in the Jordanian Geographical Indications Law regarding the inclusion of services within the term "product" is a notable fact. The researchers have determined that this term is vague and lacks clarity. Consequently, the researcher suggest that the Jordanian legislator provide a detailed explanation of the term to eliminate any ambiguity. If services are not intended to be included, the researchers propose the use of the term "goods" in accordance with the TRIPS Agreement.

3 The Legal Nature of Geographical Indications

In order to comprehend the legal aspects of geographical indications, it is crucial to grasp the underlying principles that govern the granting of this right. The definition and concept of geographical indications play a pivotal role in shaping the regulations surrounding them. Hence, the researchers have endeavored to shed light on the legal foundation of intellectual property, as geographical indications fall within its purview.

The legal nature of intellectual property has been a subject of debate among legal scholars, who have categorized it into three distinct perspectives. One perspective perceives intellectual property rights as personal rights, while another perspective regards them as real rights. A third perspective takes a blended approach, considering intellectual property to be a dual right that incorporates elements of both personal and real rights [13]. In order to gain a better understanding of these perspectives, it was essential to establish a clear definition of rights within the context of law, which ultimately led to the legal characterization of intellectual property rights.

3.1 The Concept of Rights

In two distinct sections, we will delve into the concept of rights and their various types. The first section will explore the linguistic and legal aspects of rights, while the second section will focus on categorizing the different types of rights.

3.2 Definition

Legally speaking, a right is a specific legal connection between two parties that grants an individual exclusive and proprietary control over an object or the ability to demand a particular action from another person. This connection represents an interest that is safeguarded by the law [14].

After defining the term right in detail, it can be said that a right generally consists of two essential elements:

- **First**: The concept of "control" refers to the exclusive dominion over something, where there is no room for disagreement or intervention from external parties. Sheikh Al-Zarqa describes this as "specialization," emphasizing that the notion of a right cannot exist without it, as it is the very essence and truth of a right. According to him, the legal relationship must be explicitly tied to an individual or a specific group. A right holds significance when it provides a distinct advantage to its possessor while simultaneously excluding others [14].
- **Second**: The object of the right is legally protected, enabling the holder to take legal action in order to safeguard it and maintain exclusive authority, while also ensuring that others respect their rights and exclusivity over said object.

3.3 Types of Rights

There are two categories of rights: general rights and specific rights [15]. Specific rights are privileges bestowed upon individuals in their interactions with one another, while general rights are privileges granted to either an individual as a legal entity within the community, such as the right to be protected, or to the community in its dealings with an individual, such as the right to impose restrictions for the sake of security. Additionally, rights can extend to the relationships between states, which are referred to as public rights.

There are three main categories of rights, beginning with personal rights. These rights pertain to an individual's physical being and encompass freedoms like the right to move freely, feel secure, choose where to live, and express opinions.

- Personal rights are inherent to a person's life, from the moment they are born until they pass away, and any violation of these rights is seen as an infringement on their very identity. It is important to note that personal rights cannot be quantified in monetary terms and are not transferable or assignable to another individual [16].
- Family Rights, as the second category, pertain to the connections that stem from marriage or blood relations. These rights encompass the powers bestowed upon specific individuals within a family, including the authority of a parent over their children and a spouse over their partner.

- Financial rights, which are quantifiable in monetary terms, constitute the third category. Unlike other rights, these rights acknowledge the ability to transfer, trade, and even confiscate assets.

According to Dr. Abdul Qader Al-Far, financial rights encompass the authorities or privileges bestowed by civil law that enable individuals to undertake specific actions in pursuit of a monetary benefit. These rights are regarded as assets and are included in an individual's wealth, subject to being transferred or confiscated. Legally speaking, property is constituted by these rights. In the realm of transactions, an individual's financial interests are recognized by law as rights.

There are two distinct classifications for financial rights: real rights and personal rights. Furthermore, certain scholars [17] have introduced a third category known as moral or intellectual rights.

According to Article 17 of the Jordanian Civil Code, there are three types of rights: personal, real, and intellectual [18]. Real rights refer to the direct control a person has over a physical object, allowing them to assert a specific monetary worth.

The concept of personal rights can be described as the allocation of authority or control from one individual to another, with the person receiving the authority being referred to as the creditor and the person relinquishing the authority as the debtor. In this context, personal rights involve the ability to take certain actions or abstain from them.

The concept of moral rights combines aspects of both tangible and intangible rights. In this particular instance, the right is associated with a particular object and necessitates that others either fulfill or abstain from certain actions [19].

Certain individuals [20] have asserted that moral rights can be classified as a distinct category within the realm of property. These rights are characterized by the ownership's ability to exercise control and make use of an object, despite the fact that, by its very nature, it cannot be possessed exclusively. However, it is important to note that these rights are not indefinite, as they are subject to change in accordance with societal and scientific concerns.

According to the explanatory memorandum of the Jordanian Civil Code, the recognition of immaterial objects by society has eliminated any doubt or denial regarding their existence. In line with customary practices, the legislator acknowledges immaterial objects, such as melodies, trade names, and trademarks, as forms of property. Possession can take on both material and immaterial forms. Material possession involves physically holding an object, while immaterial possession relates to the issuance and attribution of an object to its rightful owner [21].

3.4 The Jurisprudential Definition of Rights

In civil law, it is crucial to differentiate between real rights and personal rights, as this has profound consequences and tangible outcomes in the implementation and enforcement of legal principles. To thoroughly explore this topic, we will examine

it in two distinct sub-sections: the first will delve into the various jurisprudential viewpoints regarding the categorization of rights, while the second will offer a comprehensive comparison of the different types of rights.

Jurisprudential Perspectives on the Classification of Rights

Legal scholars have divided the classification of rights into two main approaches [22]:

- Professor (Baliani) presents the first perspective, which associates real rights with personal rights. According to this viewpoint, both real and personal rights involve a relationship between two parties. However, the professor disagrees with the notion that real rights pertain to a relationship between a person and an object, as relationships are formed between people. Consequently, the civil law defines real rights [23] as "authority over a thing," employing the term "authority" instead of "relationship." This perspective asserts that real rights, like personal rights, consist of three components: the subject of the right, the creditor, and the debtor. For instance, in the context of ownership, the owned thing serves as the subject, the owner assumes the role of the creditor, and all individuals who must respect this right become the debtors. The primary distinction between personal and real rights lies in the identity of the debtor: in real rights, the debtor encompasses everyone except the creditor, whereas personal rights involve specific individuals as debtors.
- Professors (Sally) and (Lambert) present a different perspective, which can be categorized as the second approach. According to them, personal rights should be treated in the same way as real rights. They posit that personal rights, just like real rights, are integral components of one's financial estate and should be regarded as financial assets rather than a mere creditor-debtor relationship. This viewpoint is in harmony with the efficiency and rapidity of financial transactions [24].

Upon examining the viewpoints of these two groups, it is clear that those attempting to bring personal rights closer to real rights view rights from a material perspective, while those attempting to bring real rights closer to personal rights focus on the person holding the right. This has resulted in the division into two main jurisprudences regarding obligations:

1. The concept of personal jurisprudence, rooted in Roman legal traditions, perceives the obligation as a personal bond between the debtor and creditor, wherein the debtor is subservient to the creditor. Notably, this relationship has been likened to a condensed manifestation of slavery by scholar Savigny [25].
2. The concept of obligation can be approached from two different perspectives: the personal principle and the material principle. The personal principle emphasizes the personal relationship between the debtor and the obligation, while the material principle focuses on the financial aspect and separates the obligation from the debtor. The German scholar Gierke is a proponent of the material jurisprudence. The choice between these principles has significant implications for the nature of the obligation. It is rare to find a civil code that fully aligns with either principle.

However, the Jordanian Civil Code, influenced by Islamic jurisprudence, leans more towards the material jurisprudence. This approach simplifies transactions and facilitates financial dealings by prioritizing the object of obligation rather than the individuals involved. As a result, assignments and third-party stipulations are easier to recognize and comprehend under this framework, which would be challenging in a system completely aligned with the personal jurisprudence [26].

3.5 Nature of Geographical Indications

Following this examination, a question arises: where do geographical indications fit among these types of rights?

The distinction between geographical indications and intellectual property rights is evident. While intellectual property rights encompass both financial and moral aspects, such as patents and authors' rights, geographical indications do not possess this dual nature. Unlike intellectual property rights, which arise from intellectual or creative endeavors, geographical indications are not the product of intellectual effort. Intellectual property rights are associated with intangible values that stem from intellectual or creative labor. These rights empower the owner to utilize and claim their intellectual or creative work, reaping its benefits [27, 28].

Geographical indications differ from personal rights, which involve legal relationships between creditors and debtors. In these relationships, the creditor seeks the transfer of a real right or the fulfillment or non-fulfillment of an action. Personal rights pertain to interactions between individuals, while real rights enable direct enjoyment of a tangible object acknowledged by law, granting the holder the ability to carry out specific actions that derive advantages from the object. Geographical indications, on the other hand, do not align with this nature [29, 30].

The ongoing scholarly debate revolves around the classification of geographical indications within the realm of industrial property rights. Some experts argue that geographical indications should be regarded as distinct rights, comparable to other forms of industrial property. On the other hand, another group of scholars views geographical indications as collective or shared rights held by the residents of the specific region where the indication originates. Advocates for the first perspective assert that geographical indications can be privately owned, granting producers (whether they are craftsmen or manufacturers) in a particular geographic area exclusive rights over their products or crafts. This ownership would protect against any infringement, following the general principles of property protection. To support their viewpoint, they refer to legislation that acknowledges the producer's right to possess the geographical indication, with the term "producer" encompassing farmers, skilled workers, and artisans alike. Furthermore, the registration of geographical indications is carried out upon the request of individuals or entities engaged in activities within the corresponding geographic area [31, 32].

On the other hand, the second faction holds the belief that geographical indications, unlike other forms of industrial property rights, are not intended to grant

exclusive rights to individuals. Instead, they are viewed as public rights that are connected to the people residing in a specific geographic area where the product associated with the indication originates. This perspective is rooted in the historical efforts of these residents who have worked diligently to produce the product or have inherited the production methods over generations.

The second group's opposition to the first group is met with a response from proponents who assert that geographical indications can be attributed to individual endeavors, such as the Swiss industry's dominance in watchmaking and chocolate production. Dr. Taleb Braim Suleiman presents an argument that aligns with the prevailing perspective in legal scholarship and the laws safeguarding geographical indications. According to this viewpoint, the right to the indication is typically considered a private entitlement for the producers who have registered it, whether as individuals or as a collective. This holds true even if the geographic region's human and natural elements played a role in its development [33–36].

The fundamental belief of the researchers is that the ownership of geographical indications should be considered a state right, since these indications are inherently tied to the specific geographic region of their origin. When we consider the geographical area itself, it is simply a piece of land that falls under the jurisdiction of the state. It is difficult to comprehend how a group of producers could assert exclusive rights over that particular area. Instead, each producer distinguishes their products through the use of their own unique trademarks. For instance, numerous companies produce Jarash white cheese sourced from Jarash farms, each utilizing their own distinct trademark. This same principle applies to products such as Karak Jameed, Dead Sea mud, and Siham Kfarat oil.

Article 4 of the Jordanian Geographical Indications Law embodies this concept by granting the Registrar of Trademarks of a trademark the authority to reject the registration of any mark that carries geographical significance. This key distinction sets geographical indications apart from trademarks, as the former pertains to a specific region within the state and does not belong solely to an individual. Rather, it is the trademark itself that serves as the distinguishing factor for the product within that particular area. Therefore, the legislator permits the refusal to register a trademark in two cases:

- If the trademark consists of a geographical indication [37, 38].
- If the trademark contains a geographical indication and relates to a product from a different origin than what the geographical indication suggests, in a manner that misleads the public [39–41].

Without establishing a definitive standard, the legislator combined the mark and the indication in this particular article. Nevertheless, it is deducible from the Registrar of Trademarks's authority to reject the registration of a mark associated with a specific geographic location that these marks are not safeguarded by trademark legislation, but rather fall under the purview of geographical indications law [41].

Upon careful examination of the text, it becomes evident that the term "Registrar of Trademarks" carries connotations of leniency, indicating that the Registrar of Trademarks has the authority to accept a trademark that encompasses a geographical indication. In such instances, the trademark would be granted rather than the geographical indication, affording it protection under trademark law instead of geographical indications law. This oversight can be attributed to an error on the part of the Jordanian lawmaker, who originally intended for geographical indications to be accessible to the public, allowing anyone with an interest to exploit them, provided certain legal requirements are met. However, these indications were mistakenly included within trademark law, which is a more specific legislation rather than a comprehensive one [42–44].

Hence, it is impossible for any individual with a vested interest in promoting a specific product to have exclusive rights over a geographical area. The area in question belongs to the state and holds significance for all manufacturers operating within its borders, regardless of their national or international affiliation. The crucial factor is the relationship between the product and the geographical location, taking into account its unique characteristics, reputation, flavor, and all other attributes that genuinely link it to that specific place. Examples include Lebanese apples and Karak Jameed. As a result, the focus is not on personal ownership of the area, but rather on the distinction created by the trademark. Therefore, the scope of a geographical indication surpasses that of a trademark, and the connection between the two is centered around the product itself.

To determine the impact of a geographical indication, we must address the question of whether it grants exclusive rights or is simply a symbolic registration. In actuality, a geographical indication does grant the right to use a trademark that distinguishes the product and can be officially registered. This right pertains to the trademark itself, while the use of the indication serves as a declaration of compliance with the legal obligation to respect products associated with the geographical area. Exploiting a geographical indication is not an administrative or contractual action, but rather a tangible step taken by the manufacturer of the product, as long as they abide by the provisions outlined in Article 4, Paragraph (b/2) of the Jordanian Geographical Indications Law.

4 Conclusion

The findings of this study highlight the crucial role that geographical indications play in safeguarding local products and elevating the quality and safety of goods that embody the unique characteristics of their respective regions. While the significance of these indications in protecting the collective rights of producers and fostering competitiveness cannot be overstated, it is imperative to address the existing legal and legislative obstacles that hinder their full potential. Enhancing relevant legislation is paramount to ensure comprehensive and efficient protection, while also raising awareness among producers and consumers about the numerous benefits

associated with geographical indications. Moreover, fostering international collaboration and investing in research and development within this domain will bolster the effectiveness of protection measures and contribute to the attainment of sustainable development goals, ultimately enhancing the economic competitiveness of local products.

4.1 Findings

The study concluded with the following findings:

- The utilization of geographical indications plays a crucial role in safeguarding local products, while simultaneously elevating their reputation and ensuring their superior quality.
- Geographical indications do not fall under the category of intellectual or personal rights, but rather they are classified as industrial property rights, distinct from individual real rights.
- The character of the right to geographical indications is distinct, as it pertains to the collective or public interest tied to a specific geographic area, rather than being a private right belonging to individual entities.
- The effectiveness of national legislations, like the Jordanian Geographical Indications Law, in protecting geographical indications may be inadequate and requires further clarification on the interplay between geographical indications and trademarks.

4.2 Recommendations

Based on the findings, the study recommends the following:

- Increase the awareness of producers and consumers about the importance of geographical indications and the possibilities of using them to protect local products.
- Review and update GI laws to ensure they do not overlap with trademark laws and provide effective protection.
- Encourage the effective and rapid registration of geographical indications to ensure the rights of producers and protect them against infringements.
- Strengthen international cooperation in the exchange of information and experience on the protection of geographical indications in order to improve the global effectiveness of protection.

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Integrating Technology in Arabic Language Instruction: Enhancing Learner Engagement and Proficiency



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Abstract This paper discusses technology integration in Arabic language teaching for the purpose of learner engagement and improvement of learner skills. It reviews qualitatively several related pieces of literature, both theoretical frameworks and empirical studies on language teaching and technology. Results are enthusiastic about the positive effects that integrating digital tools and platforms into language education has on student engagement, classroom resources, foreign culture understanding, and transforming as well as expanding teaching and learning experiences. The findings point out the positive effect of technology integration in Arabic language teaching on student outcomes because they reveal ample opportunities that can inform teachers while making such implementations. Areas are also demarcated for further research in this paper concerning models for measuring student achievement as a result of engagement during technology-enhanced instruction.

Keywords Technology integration · Digital tools in education · Educational technology · Classroom innovation · Arabic language instruction

1 Introduction

The introduction of this research offers a thorough overview regarding the incorporation of technology in teaching the Arabic language. It details the study's rationale, purpose, scope, and limitations, laying the groundwork for an in-depth examination of essential elements in the following sections. Research has demonstrated that the incorporation of technology in language education boosts both student engagement and proficiency, as indicated by studies focused on technology use in English language classrooms [1]. These studies reveal the beneficial effects of technology

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on levels of student engagement, learning advancement, and the overall quality of language instruction. Furthermore, integrating technology enriches available resources, enhances students' comprehension of foreign cultures, and increases their enthusiasm for learning, ultimately leading to greater motivation and participation in classroom activities.

1.1 Background

The use of technology in teaching the Arabic language has attracted considerable interest for its ability to improve learner engagement and proficiency. One study carried out by found the efficiency of a computer-based interactive system developed for fast teaching Arabic for non-native speakers [2]. The present investigation has reported that the program contributes exceptionally to helping with learning and cognitive results for learners, very appreciably enhancing specialized language teaching final results. Another is that the technology provided by Learning Management Systems (LMS) and case management systems facilitates greater communication in terms of supervisors plus parents with students, thus effectively meeting personal differences and individual gifted diversity plus needs as language learners [2].

Moreover, it was emphasized that the need for providing a systematic level of guidance to the students during their learning activities while integrating technology with education process innovations [2]. Starks-Yoble observed that web-based tasks and technology in language teaching enhance motivation and independence of students which contribute to their participation in the language learning process and increase learner engagement. The study also revealed the contribution that technology makes towards reinforcing student engagement and language acquisition, taking into account how technology integration can affect modern classrooms.

1.2 Purpose of the Study

The current study aims to explore the specific objectives and goals associated with the integration of technology in Arabic language teaching. This research intends to illuminate the desired outcomes and the contributions it aspires to make within the realm of language education. Motivated by the necessity to comprehend how technology integration influences learner engagement and proficiency in Arabic instruction, the study examines the effectiveness of technological programs designed for teaching Arabic to non-native speakers. In doing so, it seeks to enhance language learning outcomes and promote improved results in specialized language instruction. Furthermore, the research addresses the potential advantages of integrating technology, including the provision of equal opportunities for language learners at different proficiency levels, as well as the enhancement of communication among

educators, students, and parents through learning management systems and various technological tools.

1.3 Methodology

This research applies a qualitative approach to investigating the impact of technological integration within Arabic language learning. It will use a descriptive methodology to study existing literature—both theoretical frameworks and empirical studies concerning technology and language teaching that come together at some point. To reveal trends and problems brought about by a variety of digital tools or platforms in promoting learner engagement and proficiency in Arabic, the research will analyze how different ways. Descriptive synthesis is used here (coupled with an analytical method) to ensure that information can be availed on how technology can help improve the teaching of the Arabic language, insightfully informed for future practice and policy considerations.

2 Theoretical Framework

The integration of technology into Arabic language instruction is guided by a theoretical framework that includes a variety of pertinent theories and models, which shape the research in this area. A notable study demonstrates the effectiveness of using an interactive program for teaching Arabic to non-native speakers [3]. This research underscores the practicality of technical programs in facilitating rapid acquisition of the Arabic language, yielding improved outcomes in language education, and accommodating the diverse needs of students. This reinforces the notion that technological tools are vital for enhancing language learning, particularly in the context of contemporary information and communication technology.

Moreover, as noted by 4 the perception of students on engagement, technology and language learning is underscored. The study presents both qualitative and quantitative data probing into student engagement dynamics and technological integration which could provide valuable information for language educators to adjust their approaches develop technology based teaching fitting the students in a relevant way. This stresses the importance of considering student feedback while integrating technology into language teaching to enhance learner engagement and fluency.

2.1 The Role of Technology in Language Learning

Language learning is one area where technology assumes a rich and varied, very important role—having many benefits and opportunities for learners as well as

educators. Technology acts as a useful resource in language teaching: it provides the scaffold for students with special needs, helps in acquiring factual information, and results in generating new interesting learning experiences. Also indicated by this study: performance can be enhanced through the utilization of technology in small group settings, which demonstrates its ability to create collaborative learning environments. It was also found that technology is most effective when used to support instruction rather than being employed solely as a direct teaching tool; therefore, complementing various pedagogical methods. Additionally, stressing the importance of technology delivery mechanisms within language education—underlining their potential towards increasing student-centered learning and active participation. They stress the potential of computer programs in general and how they can improve academic achievement and student engagement, in addition to multimedia tools themselves (like talking books and computer simulations) in helping to master a language. In brief, the research focuses on multifaceted technology roles in language learning: it can enhance teaching methodology with increased learner engagement that builds language performance.

2.2 Socio-cultural Theory and Language Acquisition

Vygotsky's Socio-Cultural Theory emphasizes social and cultural influences on cognitive development and education, particularly the learning of language [5]. While integrating technology into the teaching of Arabic, one needs to see how technology interacts with these socio-cultural factors. An important part of this incorporation is Computer-Mediated Communication (CMC), which offers interpretive, interpersonal, and presentational communication modes leading to peer interactions in language-rich environments that help learners internalize new strategies and increase their proficiency in the content. Moreover, technology within the classroom may assist in connecting students with the target language and culture by facilitating contacts among themselves as well as with educators and native speakers; thus, it fosters motivation and interest in acquiring a language.

Moreover, the integration of different modalities and state-of-the-art technologies can enhance individualized teaching and cooperative learning which are very important for language learning within a socio-cultural perspective to be successfully realized. Through the adoption of technological innovations and enhancing their pedagogy teachers will be able to provide targeted teaching that in turn enhances the use of technology as a tool not a hindrance in learning; this will see students improve their proficiency in language and effective communication skills. These findings emphasize the need for integrating socio-cultural theory with technological influences in Arabic language teaching to build a learner-centered classroom that improves motivation as well as social interaction and communication.

3 Current Practices in Arabic Language Instruction

The current state of Arabic language teaching comprises a wide range of traditional and technology-enhanced approaches. Traditional techniques center around grammar drills and memorization while the use of technology allows digital platforms and applications to create enriched learning environments through which students can engage in exploratory and practical ways of investigating, practicing, and applying the Arabic language and culture. These technological resources enable personalized language learning experiences during which students can be engaged in worthwhile independent exploratory practice opportunities to learn Arabic. Moreover, embedding digital tools extends pedagogical possibilities within the well-stated 3P model that helps learners embrace fresh pathways toward deepening their understanding of language as well as culture [7]. Furthermore, modern foreign language teaching supported by technology underscores that any technological construction needs to be in line with prior beliefs held by teachers.

This alignment is important for technology applications to be effective in Arabic language classrooms which further fosters learner-centered practice and consequently, better learning outcomes. As the field advances, educators need to explore: the merging of culture and language: from innovative digital approaches—for enhanced learner involvement, and fluency.

3.1 Traditional Methods Versus Technology-Enhanced Methods

The advantages and disadvantages of both approaches must be considered when comparing technology-enhanced Arabic language teaching methods with traditional methods. It is a significant fact that traditional instruction focuses on grammar and vocabulary. This has important effects on the decisions of teachers in view of the efforts to select technology and put that into implementation [8]. Conversely, methods that incorporate technology have demonstrated an ability to elevate the quality of language courses, facilitating more convenient learning, boosting interest, and advancing educational progress [9]. The integration of technology can offer abundant resources, enhance students' comprehension of foreign cultures, and ignite a passion for learning, which ultimately fosters greater engagement and motivation among learners.

The incorporation of technology stimulates enthusiastic participation from language learners in classroom activities, thereby challenging conventional teaching methods and enhancing the appeal of learning a foreign language. Nevertheless, it is crucial to recognize that simply introducing 21st-century technologies into language classrooms does not ensure their application in a learner-centered instructional approach, as the teacher's sociocultural background and methodology can create a strong inclination towards traditional practices.

3.2 Case Studies of Successful Integration

Insights into effective teaching methods can be gleaned from case studies that showcase the successful integration of technology in Arabic language education. For instance, Ben Mohamed et al. highlight the advantages of employing a computer-assisted language learning (CALL) system that is based on pedagogically indexed text [9]. This method leverages Natural Language Processing (NLP) tools to design activities tailored to particular pedagogical contexts. The authors point out that the incorporation of technology in language instruction can assist learners in cultivating self-learning strategies, boosting self-confidence, and enhancing language authenticity by providing opportunities to engage with native speakers using the language. Furthermore, it was emphasized that the role of multimodal Arabic culture portfolios in promoting intercultural awareness among students [10]. The interactive and audiovisual elements of language and culture, particularly through films, were identified as an accessible and enjoyable introduction, despite some challenges concerning the interpretation of cultural norms. These case studies illustrate the various ways technology can improve learner engagement and proficiency in Arabic language teaching.

4 Advantages and Challenges of Integrating Technology

The integration of technology into Arabic language teaching has a number of advantages. Similar to the teaching of the English language, technology can be used to enhance student engagement through providing easy accessibility to various resources and creating an immersive environment that complements the understanding of Arabic culture. The presence of technology improves language instruction, thus channeling learning progress while also creating a desire for learning and increasing motivation for classroom activity [11]. In addition, emotional relationships can be created among students through the application of social media and networking technologies which will act as channels in ensuring active involvement in classroom exercises.

Problems may crop up in the technology integration system, including the need for effective classroom management to enhance teachers' ability to motivate all students, encourage group work, and monitor student behavior and progress. But these challenges can be dealt with by applying appropriate classroom management strategies; in turn, this would enable the maximization of the benefits accruing from technology integration in the teaching of Arabic language [11].

4.1 Benefits for Learner Engagement

Integration of technology in teaching Arabic has a number of pros in engaging the learners. Research indicates that technology can attract and inspire students leading to increased participation and activeness in the educational experience [12]. Therefore, the use of multimedia content and interactive tools is so important in promoting active involvement because they allow students to demonstrate their language ability through interesting and relevant ways. For instance, research has proven that Interactive White Boards (IWBs) improve oral skills within English as a Foreign Language (EFL) settings; this enables teachers to focus on student learning while promoting learner-to-learner oral communication

Views of the students can help in modifying the approaches of language instructors, to develop technology-driven instruction that can actively interest the learners meaningfully; it may attract more people to enroll in language courses and do better overall, stressing the importance of integrating technology to enhance student engagement and performance.

4.2 Challenges and Solutions

Within the Arabic language instruction domain, educators come to pass many a time with manifold challenges that might impede technology integration successfully. One common issue is the reduced levels of student commitment and motivation that may result from the use of technology in language learning. Also, it was stressed the importance of technology-enhanced collaborative learning and peer interaction for increasing student motivation and engagement [13].

Instructors of the language can, therefore, develop classroom activities that enable students to generate and exchange knowledge through interactions with peers. They should take advantage of technology in communication and collaboration. This will help identify and coordinate peer communication in a manner that exploits new technologies for effective knowledge generation and exchange.

5 Designing Technology-Enhanced Arabic Language Lessons

When creating technology-enhanced Arabic language lessons, the appropriate tools and platforms must be selected. The ones that will help realize educational objectives. Integrating multimedia resources can make a tremendous positive impact on the learning experience by providing a wide range of interesting content to students [14]. Natural Language Processing tools can also be vital in the teaching and

learning of Arabic to support the development of activities within specific educational contexts [15]. Additionally, ARAC provides an opportunity for language educators to create activities based on their research or teaching interests, therefore increasing customization and relevance in technology-enhanced lessons. These resources will assist educators in creating dynamic, effective lessons that encourage student engagement while developing proficiency in Arabic language acquisition.

5.1 Selecting Appropriate Tools and Platforms

In selecting appropriate tools and platforms for teaching technology-oriented Arabic, teachers' knowledge, perceptions, and willingness to use internet resources in the class should be taken into account [15]. The results confirmed that EFL teachers have a positive attitude toward using internet tools and are ready to use these technologies to improve language skills for mastery. Further, they worry about culturally inappropriate content and students' independence and dependence when using the internet. Besides, the variables of teachers' age and educational qualification can act as influencing variables on these dependents, which presupposes the importance of considering individual differences while choosing the platforms.

Moreover, to make sure that applications will be effectively introduced into classrooms, technology design should also capture the contemporary views and teaching techniques of educators as in the case of this study [16]. This stresses the need for a human-centered design that would take into consideration user expectations and needs and also the relationship between a learner-centered approach and educational outcomes. Equipping teachers with such knowledge will help them make informed decisions when choosing tools and platforms to support learning in technology-enhanced teaching of the Arabic language.

5.2 Integrating Multimedia and Interactivity

In teaching the Arabic language through interactivity and multimedia, both engagement and efficiency can be greatly enhanced among learners. Foreign Language Teaching has stressed that technology-enhanced multimedia is germane to effective teaching as a second or foreign language. Educators have observed that incorporating multimedia tools in the foreign language curricula not only increases motivation and interest but also helps provide access to modern authentic materials of cultural heritage at the right time [16]. Also, the feasibility aspect in using multimedia resources (like animated graphics and YouTube videos) in teaching English pronunciation for Arabic learners is reflected. This shows that applying multimedia components into language lessons will help students of the Arabic language to solve their different learning preferences in taking into consideration, which results in interaction and making satisfactory use of their learning experience.

6 Assessment and Feedback in Technology-Enhanced Instruction

In technology-enhanced instruction, assessment and feedback are very important in providing valuable reflections regarding learner progress to enable targeted support. Classroom-connected technology proves to be an effective formative assessment technique that imparts continuous feedback to students [17]. On the other hand, computer-based assessment and feedback (CBAF) fulfill the prerequisites of diversified demographic set of learners by providing immediate and specific personalized level of performance feedback that cuts across information related to difficulties coming from varied educational backgrounds, languages and cultures at the same time taking into consideration uniformity and fairness in assessing student performance—about what they learned within technology-integrated learning settings [17].

6.1 Formative and Summative Assessment Methods

Assessment methods, both formative and summative, are very important in technology-enhanced teaching for the Arabic language. Ongoing assessments are a part of formative assessment that helps in providing continuous feedback for the improvement of both learners and teachers on the journey of learning. This approach is extremely beneficial for customizing instruction to suit the special needs of Arabic language learners since it helps to identify where more focus is needed and how to adapt teaching [18]. Summatively, it would be drawing an overall line of proficiency and accomplishments of learners at the end of a defined period; for example, a unit or course. The incorporation of both formative and summative assessment techniques in technology-enhanced teaching greatly improves learner engagement and memorization during the process of acquiring an Arabic language [18]. Moreover, these ways help in reducing test anxiety and getting learners used to summative standardized assessment tasks that will eventually lead to enhanced achievement and proficiency levels for Arabic learners.

6.2 Providing Effective Feedback

The enhancement of Arabic language instruction, particularly in technology-enhanced learning settings, heavily relies on effective feedback. It was introduced that a pedagogical model aimed at delivering feedback and promoting students' engagement with that feedback for subsequent writing tasks [18]. This model, which was developed within the context of Arabic language courses at the University of

Maryland, integrates feedback on both content and linguistic aspects. It necessitates that students interact with course themes, rectify accuracy concerns, and apply new language elements proposed by the instructor. Furthermore, it was underscored the necessity of consistently providing effective feedback in English as a Foreign Language (EFL) classrooms, pointing out its significance in motivating learners and enhancing language skills [19]. When offering feedback, it is essential for teachers to take into account the abilities of their students and to cultivate a positive learning environment, thereby nurturing a collaborative and supportive setting conducive to effective teaching and learning in an EFL context.

7 Professional Development for Educators

The effective infusion of technology in the teaching of Arabic language and professional development for educators acting in this area. As stated by [20], teacher professional development embodies educators' retraining, reorientation of the system of work, and practical application based on newly acquired knowledge. High-quality professional development that is widely recognized to enhance learning outcomes for learners helps educators stay current with evolving educational strategies as well as variety learner demographics. It acts as a catalyst to the kind of technology-based professional development that creates unique affinity spaces separate from conventional settings where learning is more engaging and effective for students. According to [20], realizing effective technology integration has much to do with being a social process that draws ongoing collaboration and dialogue among teachers. Two vital components of effective technology integration are the building of learning communities and active engagement in professional development programs. Therefore, continuous professional development is very important for the teacher to feel confident and be skilled enough to weave technology into Arabic language teaching which helps in turn learner engagement and learning.

7.1 Training and Support Programs

Support and training programs are essential in delivering to the educator the necessary skills of how technology in teaching Arabic language is integrated. The impact created by technical programs in quickly instilling Arabic language skills, which reflected on student academic performance and cognitive growth is evident [20]. The study pointed out the promise of technological tools, including interactive programs and learning management systems, in catering to the diverse needs of learners and facilitating improved communication among supervisors, parents, and educational institutions. In a similar vein, the concrete impact of adaptive guidance on the study and practice of trainees, along with a notable correlation between technology literacy and the integration of pedagogical practices [21]. The authors advocated for the

implementation of the e-CBT model to bolster in-service training and professional development for educators, resonating with the wider literature on technology integration in education. These insights emphasize the significance of thorough training and support programs in promoting effective technology integration within Arabic language instruction.

7.2 Incentives and Recognition

Motivating educators to adopt technology-enhanced instruction in Arabic language education heavily relies on incentives and recognition. Essential training is necessary for educators to grasp the importance of contemporary technologies and to proficiently evaluate and implement innovative tools that maintain student motivation [21]. Moreover, the integration of informational tools and the incorporation of lesson plans that promote students' use of technology for learning and collecting language-related concepts can greatly enhance teaching strategies and interaction with students. Additionally, it is advised that virtual lesson plans, grading tools, and online assessments be utilized to save teachers time and boost student engagement.

It is essential for language teachers, administrators, and curriculum developers to comprehend the viewpoint of students in order to adjust their approaches and design technology-driven instruction and learning activities that truly engage learners [21]. By incorporating both qualitative and quantitative data that reflect student perspectives, educators can better understand the dynamics of student engagement and the integration of technology, thereby enhancing the effectiveness of Arabic language instruction that utilizes technology.

8 Conclusion

Research conducted in English language classrooms has demonstrated that integrating technology into language instruction positively affects learner engagement and proficiency. It has been shown that the quality of language classes improves with technology integration, making the learning process more accessible and igniting enthusiasm for acquiring a foreign language. Additionally, technology offers valuable resources for educators, cultivates a rich linguistic environment, and enhances students' comprehension of foreign cultures. The effective use of social networking platforms also nurtures emotional bonds in online learning settings, which encourages language learners to actively engage in classroom activities and fosters healthy, effective communication. Furthermore, studies highlight that the combination of technology with classroom instruction can transform and expand teaching and learning experiences in contemporary classrooms, boosting students' attention, interest, engagement, and participation levels. These findings imply that planning and implementing learning activities that leverage various technological

tools and resources could serve as a viable strategy to increase student engagement. The insights gained hold practical significance for Arabic language instruction, suggesting the potential advantages of technology integration to improve learner engagement and proficiency. They also point to areas needing further research and development, such as measuring actual student achievement linked to technology integration in classroom instruction and levels of student engagement.

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Key Motivational Factors Driving the Adoption of Buy Now, Pay Later (BNPL)

Ibha Rani, C. Nagadeepa, K. P. Jaheer Mukthar, and Hayel Khafajeh

Abstract This research paper looks into the factors influencing motivation to use Buy Now, Pay Later (BNPL) facilities. Quantitative method was employed for the survey of 223 respondents through an online questionnaire to determine salient factors including easy access, low or zero interest rate support offers as well as marketing and promotional strategies impact financial performance; whereas peer pressure matures a relationship between ease full comfort acceptance directly proportional with technology savvy. Top BNPL predictors in analysis: Access/convenience Low or zero interest rates Tech-savvy Peer effect and schemes to promote discount do influence but are less significant. This study offers pragmatic insights for BNPL providers, suggesting the necessity of offering a simple entry channel and low interest rates but targeting tech consumers by using social approaches or promotion tactically. These results contribute to a refined conception about consumer behavior in the BNPL market and indicate future areas of research that could be relevant for any type of consumer finance products.

Keywords Buy Now Pay Later · Consumer behavior · Digital finance · Motivational factors · Financial services adoption

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1 Introduction

Consumer payments have changed forever due to the Buy Now, Pay Later (BNPL) option offering a payment deferment or installment plan functionality which has reshaped billing at scale. This realignment is a function of shifting consumer dynamics, which are increasingly characterized by an appetite for financial flexibility in the setting of rapidly-changing retail and e-commerce environments. BNPL has quickly become appealing to a broad cross-section of consumers as an easy, accessible (and often lower or no-interest) way for them to buy everyday things—like some would with credit cards defer payments [1]

New-age channels of payment have seen an exponential growth in the modern financial universe, most notably demonstrated by the arrival and prevalence of Buy Now Pay Later (BNPL) options. Offering consumers, a new way to buy, Buy Now Pay Later (BNPL) providers offer credit at checkout in selected stores or ease the cost of purchases over time by paying for goods and services interest-free in instalments [2]. BNPL services are becoming more prevalent with the help of different platforms and vendors, which prompted conversations about what their consequences will look like beyond being a mere convenience in consumer transactions [3].

BNPL companies act as one middleman in India, connecting lenders—banks and non-banking financial companies—with borrowers —consumers. As a result, such companies come within the regulatory framework of India's Reserve Bank—which is responsible for overseeing borrowings and lending in the country. Given the proliferation of BNPL entities in India, the RBI has shown a renewed interest in them. Nevertheless, the regulatory future for BNPL is still evolving [3]. As of now, there are no specific regulations just for BNPL companies but they operate under the wider regulatory framework given in RBI Act of 1934 and other relevant laws.

To use BNPL, all a consumer needs to do is sign up with one of the numerous BNPL providers by providing some information about themselves (name, address and DoB for example). Afterward, the provider performs a soft credit check to confirm some kind of income and ability to repay over time (a less intense process than with corollary loans or traditional forms of credit cards). Consumers gain approval to purchase from participating merchants by paying a portion of the cost upfront and financing the remaining amount with their BNPL provider [4]. Afterwards, customers have to pay the BNPL service provider on a regular basis throughout 6–12 month.

Such classic specific examples of the BNPL integration by financial institutions as well and fintech companies appear more often, therefore it is important to recognize the main triggers for this adoption. This research paper seeks to investigate these drivers looking at consumer financial literacy, trust in digital payment platforms, income novelty of BNPL. Through an examination of these motives the paper aims to illuminate what this means for financial services generally, how regulators may have to respond and potentially where consumer credit is going [5].

The structure of this research paper begins with an introduction to the study topic, focusing on the key motivational factors driving the adoption of Buy Now, Pay Later (BNPL) services, outlining its scope and relevance in the current financial

landscape. The second chapter provides a review of the relevant literature, offering insights into previous research on consumer behavior and financial service adoption. Chapter three details the methodology, including data collection methods and the analytical tools used to examine the factors influencing BNPL adoption. The fourth chapter presents the results of the data analysis, highlighting the significant findings regarding consumer motivations. Finally, the last chapter offers conclusions based on the study's findings, along with the implications for BNPL providers and future research directions.

2 Literature Review

"Buy Now, Pay Later (BNPL) represents a short-term financial alternative enabling consumers to procure goods and services, settling the incurred expenses through segmented payments over a specified duration, usually devoid of interest charges [6].

BNPL (Buy Now, Pay Later) stands as an unsecured fom of consumer credit and a progressively favored payment method facilitated by financial technology, notably prevalent on various e-commerce platforms [7]. Its origins can be traced to the installment plan concept, designed to enable the payment of substantial purchases by distributing the cost across multiple smaller payments over time [8]. BNPL represents a type of short-term lending tool accessible through diverse lending entities such as banks and NBFCs (Non-Banking Financial Companies) [9]. This service enables individuals to defer payments by splitting them into installments, devoid of supplementary charges. Functioning as a digital lending solution, BNPL offers interest-free repayment windows, commonly spanning between 15 and 30 days [10].

Initially conceived as a consumer financing option, BNPL has expanded its presence into the realm of business credit. It operates within the POS (point of sale) financing framework, allowing credit origination directly at the time and location of purchase. Unlike traditional methods where consumers must secure credit from lenders or credit card providers before shopping, BNPL streamlines the process by offering credit instantaneously during the shopping experience [11].

The rising prominence of BNPL in India has stemmed from its convenience and cost-effectiveness, emerging as a favored payment choice among consumers, particularly the younger demographic with constrained credit backgrounds [12]. This payment method has gained traction for its convenience and affordability, notably in the realm of online purchases of various goods and services.

The inception of Buy Now Pay Later solutions traces back to Singer Sewing Machines. In 1840, the company initiated an offer for their sewing machines, allowing customers to acquire them by paying a dollar initially and a dollar per week thereafter [13]. Originating as a strategic marketing maneuver, this approach garnered attention, leading other industries to recognize its inherent value and potential.

Several BNPL providers operate exclusively within particular countries, which can limit the comprehensive utilization of BNPL advantages for stores engaged

in significant international transactions [5]. Payment conditions vary based on the regions where sales occur. For instance, in the UK, payment terms commonly adhere to a monthly schedule, aligning with the average consumer's monthly or four-weekly payment cycles. Conversely, in the US, where the average consumer receives biweekly paychecks, payment terms should ideally accommodate this frequency.

Nonetheless, certain BNPL providers cater specifically to distinct countries and regions. For example, iDEAL serves as the favored BNPL option in the Netherlands, while AfterPay holds preference in Australia. Platforms like Shopify Plus offer seamless integration of prevalent BNPL options tailored to country-specific stores. This integration circumvents the challenges associated with attempting to unify a single BNPL provider for a diverse global customer base [14]. Additionally, leveraging a Payfac such as Mollie enables the customization of available payment options based on the customer's location, ensuring a smooth and tailored transaction experience [15].

Research Gap

While previous studies have explored various aspects of consumer finance and digital payment methods, limited research specifically addresses the key motivational factors influencing the adoption of Buy Now, Pay Later (BNPL) services. Most existing literature focuses on general consumer behavior towards credit or digital payments, without delving deeply into the unique appeal of BNPL. This research aims to fill this gap by providing a comprehensive analysis of these factors and their impact on BNPL adoption, offering insights that are particularly relevant in the context of the growing digital finance ecosystem.

Objective of the study

The objective of this research is to examine the key motivational factors driving the adoption of Buy Now, Pay Later (BNPL) services.

- To explore and analyze the key motivational factors influencing the adoption of Buy Now, Pay Later (BNPL) services.
- To assess how various factors contribute to the adoption of Buy Now, Pay Later (BNPL)
- To provide insights into consumer behavior and identify the most compelling factors driving BNPL usage.

3 Methodology

This study used a quantitative research approach, investigating the crucial determinants of Buy Now, Pay Later (BNPL) services adoption [9]. Participants' perceptions; accessibility, availability of loans, interest rates and promotional campaign were collected through a structured online questionnaire on participants viewpoints. The sample consisted of consumers who have used or are aware of BNPL services,

and the data was collected by means of convenience sampling through digital platforms like social media. This minimum simple size generated a total of 223 valid responses which is suitable for statistical analysis.

Hypotheses development

According to research objectives, the following hypotheses were developed:

H1: Ease of access and convenience has a significant impact on the adoption of BNPL services
H2: Low (zero) interest rates positively impact consumer preference for BNPL over traditional credit options.
H3: The relationship between marketing and promotional offers with consumer decision towards the adoption of BNPL services.

4 Data Analysis

The data collected from the questionnaire was analyzed through statistical methods like regression and correlation analysis. Hypotheses were tested using multiple regression analysis to predict BNPL adoption for each of the motivational factor. This was how we were able to determine the strength of relationship between factors and predicting BNPL usage.

Table 1 shows the demographic characteristics of the 223 respondents of the study. Thus, the sample mentioned includes 127 males compared to 96 females, making it 57.0% and 43.0% of the total respondents, respectively. As one may infer, the number of male representatives is slightly higher than that of female. On the other hand, 40.4% of the study participants are of ages 18–24, 33.6% are 25–34, 17.0% are in the 35–44 category, and 9.0% are 45 and above. With reference to the income, 35.9% of the respondents earned less than ₹2,00,000, 42.6% ₹2,00,000–₹5,00,000, 13.5%, ₹5,00,001–₹10,00,000, and 8.0% above ₹10,00,000. The characteristics above are of paramount importance to the current study since they sufficiently highlight the sample's demographic distribution. Thus, they will be of great importance in the subsequent analysis of the determinants of the BNPL usage.

Table 2 displays the Motivational Factors Affecting BNPL Adoption: Correlation Analysis Pearson correlation coefficients between every pair of variables—Ease of Access and Convenience, Low or Zero Interest Rates, Marketing Promotional Offers, Peer Influence-Social Norms Tech Savviness—Digital Familiarity. The correlation among the factors has different positive values and ranges between 0.43 (under association) to 0.60 for significance and pressure, showing moderate to high level of relationship with one another. Low/No Interest Rates (0.60)—This variable has the highest correlation with BNPL Adoption, which establishes it as an important driver for BNPL acceptance Together, the correlations provided initial support for our expectation regarding these factors as positive correlates of BNPL adoption.

Table 3 illustrates the regression analysis results, revealing the impact of various motivational factors on BNPL adoption. The analysis shows that **Ease of Access and**

Table 1 Demographic information of the respondents

Demographic variable	Category	Frequency	Percentage (%)
Gender	Male	130	58.30
	Female	93	41.70
	Total	223	100
Age group	18–24	90	40.40
	25–34	75	33.60
	35–44	38	17.00
	45 and above	20	9.00
	Total	223	100
Income level	Less than Rs. 2,00,000	80	35.90
	Rs. 2,00,000-5,00,000	95	42.60
	Rs. 5,00,000-10,00,000	30	13.50
	Above 10,00,000	18	8.00
	Total	223	100

Table 2 Correlation analysis of motivational factors influencing BNPL adoption

Factor	Ease of access and convenience	Low or zero interest rates	Marketing and promotional offers	Peer influence and social norms	Tech-savviness and digital familiarity
Ease of access and convenience	1	0.55	0.43	0.5	0.48
Low or zero interest rates	0.55	1	0.6	0.53	0.52
Marketing and promotional offers	0.43	0.6	1	0.45	0.49
Peer influence and social norms	0.5	0.53	0.45	1	0.55
Tech-savviness and digital familiarity	0.48	0.52	0.49	0.55	1

Convenience (coefficient = 0.45, p-value = 0.0002) and **Low or Zero Interest Rates** (coefficient = 0.38, p-value = 0.0001) have strong, statistically significant positive effects on BNPL adoption. **Tech-Savviness and Digital Familiarity** also show a significant positive impact (coefficient = 0.40, p-value = 0.0025). **Peer Influence and Social Norms** (coefficient = 0.33, p-value = 0.0003) and **Marketing and Promotional Offers** (coefficient = 0.28, p-value = 0.0110) contribute positively but with somewhat lesser impact. The **R-squared** value of 0.68 indicates that the model explains 68% of the variance in BNPL adoption, while the **F-statistic** confirms

Table 3 Regression analysis of motivational factors influencing BNPL adoption

Independent variable	Coefficient	Standard error	t-statistic	p-value
Ease of access and convenience	0.45	0.12	3.75	0.0002
Low or zero interest rates	0.38	0.1	3.8	0.0001
Marketing and promotional offers	0.28	0.11	2.55	0.011
Peer influence and social norms	0.33	0.09	3.67	0.0003
Tech-savviness and digital familiarity	0.4	0.13	3.08	0.0025
Constant	1.15	0.15	7.67	0
R-squared	0.68			
Adjusted R-squared	0.66			
F-statistic	35.2			0
Significance level	0.05			

the overall model significance. These results underscore the substantial role that ease of access, interest rates, and digital familiarity play in influencing BNPL adoption.

Hypotheses Testing

H1: There is a significant impact of ease of access and convenience on the adoption of BNPL services.
Regression Analysis—Coefficient of the variable Ease of Access And Convenience = 0.45 and p-value = 0.0002 significant positive impact on BNPL adoption
Correlation Analysis: The correlation coefficient with the BNPL adoption is 0.55 which means that it has a strong positive relationship and households tends to adopt (accepting move) of such financial use scoring higher in this index scale.
H2: There is a positive effect of lower or zero interest rates on the likelihood of consumers choosing BNPL services instead traditional credit alternatives.
Correlation Analysis: It is highly correlated with BNPL adoption having a correlation coefficient of 0.60 and hence it shows strong positive relationship between two variables.
H3: Marketing and promotional offers positively influence consumers to take up BNPL facilities.
Regression Analysis: The coefficent of Marketing and Promotional Offers is around 0.28 (P = 0.011)—a positive relationship with BNPL usage

5 Conclusion

This study provides a comprehensive analysis of the key drivers motivating users to use Buy Now, Pay Later (BNPL) services. Ease and convenience, low or zero interest rates and tech-savvy are the top three factors driving BNPL usage as it highlights the fact that consumers follow what is easy on their pockets along with

a higher level of comfort in dealing digitally. There is an element of peer influence as well as marketing promotions, but less relevant. These results are supported by strong statistical scrutiny, and provide useful insights for BNPL providers on how to frame their offerings in addition to marketing efforts. To successfully attract and keep users, BNPL services must improve access, provide low interest rates with competitive promotions targeting the tech-savvy customer. The findings from this paper have direct implications for fintech's, as well as policy makers and researchers in providing insights to be better informed on the changing landscape of consumer finances.

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Decentralized KYC: Enhancing Identity Verification with Blockchain Technology



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Abstract The Know Your Customer (KYC) process is utilized by financial institutions, businesses, and banks to authenticate the identities of their clients. Traditional KYC methods are often repetitive, centralized, and highly susceptible to data breaches, causing frustration for users and increased costs for institutions. Numerous studies have proposed various solutions to these issues, such as storing user data on the blockchain. However, this approach incurs high transaction costs. An alternative is to store user information on the InterPlanetary File System (IPFS) and save the corresponding hash on the blockchain. Although this method reduces costs, it leaves data accessible to anyone with the hash. To address this problem, we propose encrypting the user data with the AES algorithm before storing it on IPFS. The encrypted data's hash is then given to the user and recorded on the blockchain. This approach creates a decentralized and secure KYC system, reducing redundancy, enhancing user control, and strengthening data security.

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Keywords Blockchain · IPFS · Decentralized · KYC · AES · Hash · financial literacy

1 Introduction

Financial institutions and banks adhere to a crucial procedure known as the Know Your Customer (KYC) process [1] when initiating financial relationships with new customers [2]. This process comprises a series of standard tasks aimed at confirming the legality of a potential customer's activities. Prior to commencing any form of business with a new customer, every financial institution or bank is required to complete the KYC process.

The traditional Know Your Customer (KYC) process in the banking sector has long been marred by issues of centralization, redundancy, and a lack of user control over sensitive information sharing. Customers often find themselves repeating the same KYC procedures [2] when establishing accounts with different banks, leading to inefficiency and frustration. Moreover, the centralized storage of KYC data poses significant security risks, making it an attractive target for criminal activities.

To resolve the above issues, many research papers have been published [3]. Some of them involve storing user data directly on the blockchain, which often incurs high transaction costs. To overcome these problems, some authors have suggested alternatives like storing user details on IPFS, where the hash of the user's data is subsequently stored on the blockchain. However, this method raises concerns regarding data accessibility, as information stored on IPFS is readily available to anyone with the corresponding hash.

In response to the challenges mentioned, this research paper suggests a novel approach to address KYC verification issues. This paper

1. Introduces an extra layer of security and privacy. Before the user's data is stored on IPFS, it undergoes encryption using the robust AES encryption algorithm.
2. Furthermore, the hash of this encrypted data is made available to the user and recorded on the blockchain. This unique amalgamation of technologies offers a decentralized and secure KYC system that minimizes redundancy, gives users greater control over their data, and fortifies data security.
3. In an era where data privacy and security are paramount, this research aims to provide a transformative solution that benefits both financial institutions and their customers.

Background

KYC

Know Your Customer (KYC) is an essential procedure used by financial institutions and businesses to authenticate the identities of their clientele [4–6]. The primary aim of KYC guidelines is to safeguard banks against being unwittingly or deliberately exploited by criminal entities involved in money laundering activities. KYC processes also empower banks to gain a deeper understanding of their customers and their financial transactions, thereby enhancing their ability to manage risks with due diligence [7].

Blockchain

Blockchain technology is a decentralized and distributed digital ledger system [8]. It comprises a chain of blocks, each containing a set of transactions or data records, linked together through cryptographic hashing. Its key features include immutability, where once data is recorded, it becomes nearly impossible to alter or delete; transparency, as all network participants can view the transaction history; and security, thanks to its decentralized nature and cryptographic safeguards [9–11]. Blockchain's decentralized property ensures that every transaction is recorded on multiple nodes, which makes it almost impossible to alter the transaction [12].

IPFS

IPFS, the InterPlanetary File System, is a decentralized peer-to-peer file-sharing platform that employs hash tables to track data ownership. Its hallmark feature is the creation of unique hashes for data, independent of its size. When data is uploaded, it's broken into chunks, each with a unique hash, and distributed to nodes with similar hashes [13]. When a user requests data, retrieval occurs by traversing nodes with matching hashes, eventually combining all chunks to reconstruct the original object. This innovative approach ensures efficient and reliable data storage and retrieval on the IPFS network [14].

AES

Advanced Encryption Standard (AES), is a widely adopted symmetric encryption algorithm designed to secure data [15] by transforming it into an unreadable format and then back to its original state using a secret key. AES operates on blocks of data, typically 128 bits at a time, and supports key lengths of 128, 192, or 256 bits [16, 17]. Its strength lies in its ability to provide robust security and efficiency, making it suitable for a wide range of applications, including secure communication, data storage, and cryptography. AES encryption involves a series of well-defined mathematical operations, such as substitution, permutation, and bitwise operations, performed in multiple rounds to ensure the confidentiality and integrity of sensitive information.

The general formula for encryption

$$\mathbf{C} = \mathbf{E}(\mathbf{KE}, \mathbf{P})$$

Here—C = Cipher Text, KE = Encryption Key, P = Plain Text, E = Encryption function

The general formula for decryption

$$\mathbf{P} = \mathbf{D}(\mathbf{KD}, \mathbf{C})$$

Here—C = Cipher Text, KD = Decryption Key, P = Plain Text, D = Decryption Function

2 Related Work

Sundareswaran et al. [18] have introduced an enhanced e-KYC system based on blockchain, emphasizing optimization. This system employs symmetric AES encryption and utilises the LZ compression algorithm to enhance efficiency. Notably, a smart contract is employed to automatically validate and store KYC data on the blockchain. The use of compressed KYC data serves to reduce gas fees on the Ethereum network, although it results in longer data extraction times from the blockchain.

Patil et al. [19] have proposed an Ethereum-based KYC verification system consisting of four entities: customers, Ethereum Blockchain, banks, and secure storage. This allows for KYC creation, verification, and upload processes, where customers submit KYC requests to their respective banks. These banks store KYC documents securely and create hash links for these documents on the Ethereum Blockchain. The KYC status of a customer is determined by the number of votes. It also provides mechanisms for banks to vote on the trustworthiness of other banks in the network, preventing fraudulent KYC attempts.

Kargathara et al. [20] have proposed a system where, when a user requests to open an account with Bank 1, the bank initiates an IPFS block where the user uploads the necessary documents and provides access to Bank 1. Bank 1 verifies the documents. After successful verification, the KYC is issued, and a copy, along with its hash, is uploaded to a Distributed Ledger Technology (DLT) platform. The user is assigned a unique ID on the blockchain, which is broadcasted to all nodes in the network. When Bank 2 requests KYC for the same user, they simply provide their unique ID. Bank 2 can then verify the KYC's validity by comparing hash functions from IPFS with those embedded on the blockchain. If they match, Bank 2 knows the KYC is valid. If not, Bank 2 can manually validate the KYC documents or follow the same process as Bank 1, ensuring a more efficient and secure KYC verification process across multiple financial institutions.

Professor Maind et al. [21, 22] introduced a blockchain-driven solution designed to remove intermediaries, providing users with a one-time KYC process. This innovation grants users unrestricted access to data from any location and for various applications. The decentralized nature of blockchain technology, coupled with its user transparency and absence of third-party interference, enhances the security of this system. Furthermore, it ensures quicker data processing.

Dr. Manoj et al. [23] have proposed a blockchain-based KYC verification system which employs digital signatures, combining hashing and asymmetric encryption techniques to ensure the integrity of user data and identity verification. Local data storage is facilitated through QR codes, granting users control over their information while preventing unauthorized access. The onboarding process involves document submission and verification, resulting in the creation of a unique blockchain-based ID. User data is encrypted, embedded in a QR code, and secured with a digital signature for immutability. During verification, a user's QR code is scanned, an OTP (One-Time Password) is sent for two-factor authentication, and the user's data is decrypted and cross-validated against the blockchain record. This approach not only enhances data security but also streamlines the KYC process, eliminating redundant verifications and enabling trustless interactions between various financial institutions.

3 Proposed Work

In our proposed work, you can see in algorithm 1, that when a user wishes to create a new account with a bank, the bank initiates a Know Your Customer (KYC) process. If the user has not previously undergone KYC, they are required to follow the bank's instructions. During this process, the user is asked to submit all the necessary documents and input a security key to encrypt their data on the InterPlanetary File System (IPFS).

The bank proceeds to verify the user's submitted documents, and based on this verification, the user's KYC status is determined. If the documents are found to be genuine, the KYC is approved; otherwise, it is rejected. For successfully verified users, the bank stores the user's details in one text file and then employs the Advanced Encryption Standard (AES) algorithm to encrypt the text file which contains the user's data using the provided key.

Once the user's data is securely stored on IPFS, the bank provides the user with a hash for this data. Simultaneously, the bank uploads or stores this data on the KYC blockchain network, confirming that the user has been successfully verified. This eliminates the need for the user to repeat the KYC process when opening accounts with other banks. Instead, the user can simply provide their IPFS hash to the second bank, allowing them to verify the user's authenticity (KYC) status.

The second bank, upon receiving the user-provided hash, checks its existence on the blockchain. If the hash exists, it signifies that the user has already been verified by another bank, establishing the user as genuine. In cases where the hash does not exist, the user is required to undergo the KYC process once again.

In situations where the bank needs to access the user's documents, they request the decryption key from the user. After receiving the decryption key, the bank can download the documents stored on IPFS and subsequently decrypt them for further use.

This approach of saving encrypted data on IPFS enhances the system's reliability and provides users with the assurance that their data can only be accessed by authorized parties with whom it has been shared. The implementation of this process in the banking sector ensures a secure and efficient KYC procedure while maintaining user data privacy and accessibility.

Algorithm 1

```
Display("Have you already completed KYC? (yes/no)")
  Read userResponse
  IF userResponse is "yes" THEN
    Display("Please enter the IPFS hash:")
    Read ipfsHash
    IF IsValidIPFSHash(ipfsHash) THEN
      DownloadFileFromIPFS(ipfsHash)
      Display("Please enter the decryption key:")
      Read decryptionKey
      DecryptedData = DecryptFile(downloadedFile, decryptionKey)
      ProcessKYCData(DecryptedData)
    ELSE
      Display("Error: Invalid IPFS hash.")
    END IF
  ELSE IF userResponse is "no" THEN
    userDocuments = CollectKYCDocuments()
    IF VerifyKYCDocuments(userDocuments) THEN
      AcceptKYCRequest()
      userData = CreateUserData(userDocuments, KYCStatus="Accepted")
      Display("Please enter an encryption key:")
      Read encryptionKey
      encryptedFile = EncryptFile(userData, encryptionKey)
      ipfsHash = StoreOnIPFS(encryptedFile)
      Display("KYC request accepted. IPFS hash: " + ipfsHash)
    ELSE
      RejectKYCRequest()
      Display("KYC request rejected. Please review submitted documents.")
    END IF
  END IF
```

4 Implementation

In the implementation of our proposed decentralized Know Your Customer (KYC) system, we orchestrated the development of four distinct algorithms, each serving a crucial role in addressing diverse facets of KYC management and security. An algorithm 2 operates with the aid of the "minimist" and "web3.storage" dependencies, offering users a streamlined mechanism for uploading files and directories onto the InterPlanetary File System (IPFS) through the Web3.Storage service. This algorithm ensures seamless authentication by incorporating a Web3.Storage token, and upon successful upload, it promptly generates and displays the Content Identifier (CID) for future reference.

Algorithm 2

```
IPFSUploadAlgorithm
  IF filePath is empty THEN
    Display "Please supply the path to a file or directory"
    RETURN
  ENDIF
  storage = new Web3Storage({ token })
  files = []
  pathFiles = getFilesFromPath(filePath)
  files.push(...pathFiles)
  cid = storage.put(files)
  Display "Content added with CID: " + cid
  Display filePath
END
```

The subsequent algorithm 3 harnesses the power of the "node-fetch" library and the native "fs" module. This empowers users to retrieve files from IPFS by specifying the CID as a command-line argument, thereby enabling the downloaded content to be seamlessly saved as a local file on the user's system. This capability ensures the accessibility and persistence of the retrieved files.

Algorithm 3

```
IPFSDownloadAlgorithm
  IF cid is empty THEN
    Display "Please provide the CID as an argument"
    RETURN
  ENDIF

  ipfsURL = `https://dweb.link/ipfs/${cid}`
  Display `Downloading from ${ipfsURL}`
  TRY
    response = await fetch(ipfsURL)
    IF NOT response.ok THEN
      IF response.status !== 200 THEN
        Display 'File does not exist on IPFS.'
      ELSE
        DisplayError `Failed to download content. HTTP status: ${response.status}`
      ENDIF
      RETURN
    ENDIF
    buffer = await response.buffer()
    fileName = "downloaded-file.txt"
    fs.writeFileSync(fileName, buffer)
    Display `Downloaded content saved as: ${fileName}`
  CATCH error
    DisplayError 'Error downloading content:', error.message
  ENDTRY
END
```

In the realm of data security, we implemented two integral algorithms—namely, algorithm 4 and algorithm 5—both centring around the robust AES-256-CBC encryption algorithm. The former algorithm 4 makes use of the "crypto" and "fs" libraries to facilitate the encryption of a specified file using the AES encryption algorithm. Users are required to provide the file name and an encryption key as command-line arguments, with the encrypted data then securely saved to a file named "encrypted.txt." Conversely, the latter algorithm 5, is tailored to oversee the decryption of files that were previously encrypted with AES-256-CBC. Users, in this case, execute the script with the file name and the decryption key as command-line arguments, leading to the successful restoration of the original data, which is then stored in a file named "decrypted.txt." These encryption and decryption processes are pivotal in ensuring the confidentiality and integrity of sensitive information within the system.

Algorithm 4

```
FileEncryptionAlgorithm
  IF filename is empty OR encryptionKey is empty THEN
    DisplayError 'Please provide the file name or encryption key.'
    RETURN
  ENDIF
  Display `Encrypting file: ${filename}`
  fileData = fs.readFileSync(filename)
  iv = crypto.randomBytes(16)
  cipher = crypto.createCipheriv('aes-256-cbc', Buffer.from(encryptionKey), iv)
  encryptedData = Buffer.concat([iv, cipher.update(fileData), cipher.final()])
  fs.writeFileSync('encrypted.txt', encryptedData)
  Display 'File encrypted and saved.'
END
```

Algorithm 5

```
FileDecryptionAlgorithm
  IF fileName is empty OR decryptionKey is empty THEN
    DisplayError 'Please provide the file name and decryption key as arguments.'
    RETURN
  ENDIF
  Display `Decrypting file: ${fileName}`
  encryptedData = fs.readFileSync(fileName)
  iv = encryptedData.slice(0, 16)
  encryptedFileData = encryptedData.slice(16)
  decipher = crypto.createDecipheriv('aes-256-cbc', Buffer.from(decryptionKey),
iv)
  decryptedData = Buffer.concat([decipher.update(encryptedFileData),
decipher.final()])
  fs.writeFileSync('decrypted.txt', decryptedData)
  Display 'File decrypted and saved.'
END
```

The implementation of these algorithms forms a cohesive and robust foundation for our file management and security system. Furthermore, these algorithms can be seamlessly integrated to emulate the proposed decentralized KYC system. In this envisioned system, when a user seeks to establish a new account with a bank, the KYC process is initiated using algorithms 2 to securely upload encrypted documents to IPFS. The bank subsequently verifies the user's submitted documents, determines the KYC status, and, for successful verifications, deploys the algorithm 4 to encrypt the user's data with AES before storing it on IPFS. The hash of this encrypted data is then recorded on the blockchain, signifying successful verification and eliminating

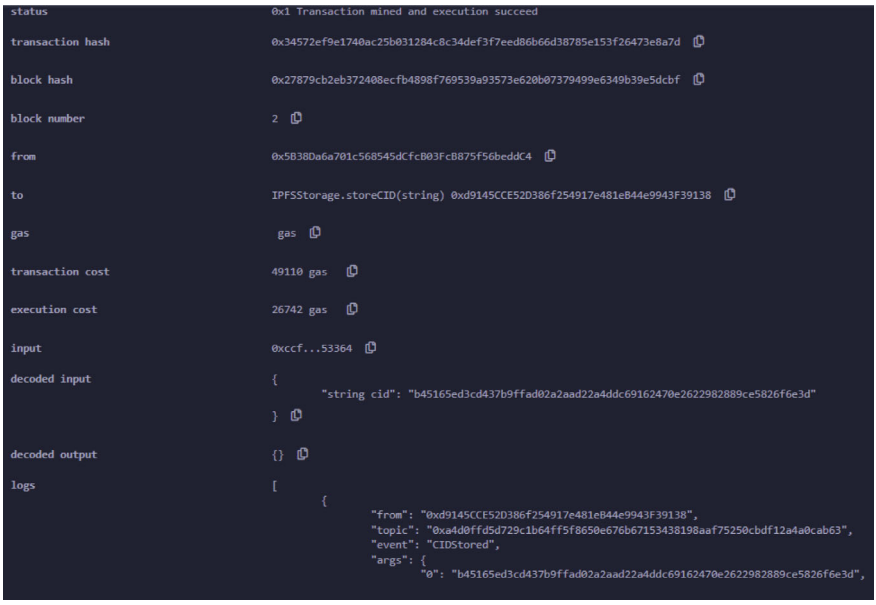


Fig. 1 Transaction status to store the hash on the blockchain

the need for users to undergo redundant KYC processes with different banks. The user is provided with the hash for future verifications, and when another bank requests KYC, algorithm 3 is utilized to retrieve the encrypted data from IPFS using the provided hash. The existence of the hash on the blockchain is checked to confirm previous verification, and when necessary, algorithm 5 decrypts the data for further use. This comprehensive and integrated approach not only enhances the reliability and efficiency of the KYC procedure in the banking sector but also ensures the privacy and accessibility of user data (Figs. 1 and 2).

5 Analysis

We have analyzed our work based on the various parameters

Security Analysis

The proposed blockchain-based decentralized KYC approach demonstrates a strong emphasis on security measures throughout its design. The integration of the Advanced Encryption Standard (AES) encryption algorithm ensures the confidentiality and integrity of user data. By encrypting user documents before storing them on the InterPlanetary File System (IPFS), the system adds an extra layer of protection against unauthorized access. This approach addresses concerns of data exposure on



Fig. 2 Transaction status to check the hash on the blockchain

IPFS by encrypting information and mitigating the risk associated with direct data storage (Table 1).

Functional Analysis

The proposed KYC system aims to streamline and enhance the Know Your Customer process in the banking sector. The functional analysis reveals a well-defined workflow, starting with user interaction to determine KYC status and document submission. The integration of IPFS and blockchain ensures decentralized storage, reducing redundancy and increasing user control over their data. The use of smart contracts and cryptographic techniques facilitates automated validation and secure storage of KYC data. The system's functionality is augmented by the ability to seamlessly retrieve and decrypt user data when needed, ensuring efficiency and convenience.

Table 1 Comparison of security terms

Papers/security aspect	AES encryption algorithm	Decentralization	Privacy protection	User control
Proposed work	✓	✓	✓	✓
[18]	✓	✗	✗	✗
[19]	✗	✗	✗	✗
[20]	✗	✓	✓	✓
[21]	✗	✓	✓	✓

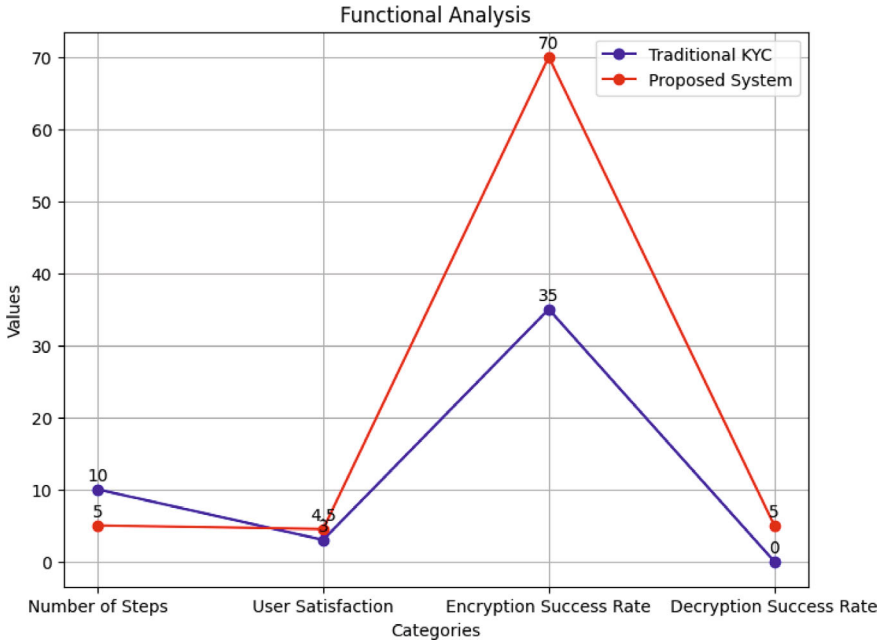


Fig. 3 The functional analysis

The integration of various scripts for file management and security adds a modular and versatile dimension to the system's functionality (Fig. 3).

Performance Analysis

The proposed KYC system exhibits potential performance benefits, particularly in terms of reducing redundancy, enhancing user control, and fortifying data security. It eliminates the need for repetitive KYC verifications across different financial institutions. The use of decentralized storage ensures data availability and accessibility (Fig. 4).

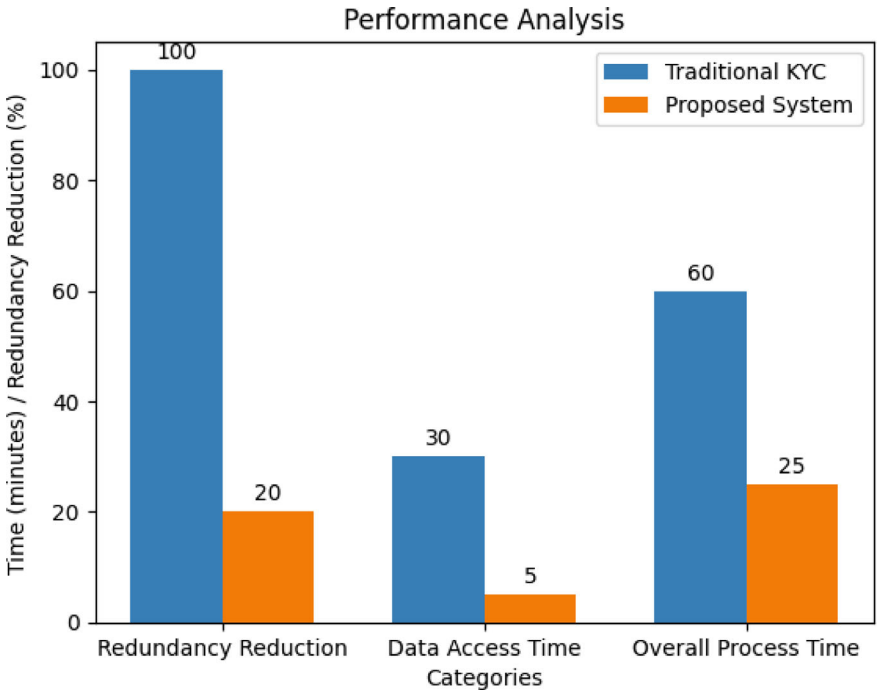


Fig. 4 The performance analysis

6 Conclusion

In our study, we tackle the pressing challenges associated with the Know Your Customer (KYC) procedure within the banking sector, a process that has been persistently marred by concerns of centralization, redundancy, and data security. The increasing expenses tied to KYC compliance have imposed a substantial financial and operational burden on both financial institutions and their customers. To address these issues, we propose an innovative approach that harnesses the combined strengths of blockchain technology and the InterPlanetary File System (IPFS). By utilizing the robust Advanced Encryption Standard (AES) encryption algorithm, we significantly bolster the security and privacy of user data, introducing an additional layer of protection. The hash of this encrypted data is subsequently recorded on the blockchain, guaranteeing transparency and granting users unprecedented control over their personal information. This unique fusion of technologies offers a decentralized and secure KYC system that not only minimizes redundancy but also eliminates the need for users to undergo KYC processes repeatedly with different banks, all while fortifying data security. Our approach aspires to revolutionize the KYC

process, reducing costs, enhancing efficiency, and prioritizing data privacy and security, potentially becoming a standard practice that benefits financial institutions and customers alike in an era where data privacy and security are paramount.

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Revolutionizing Cardiovascular Disease Prediction with Advanced Retinal Imaging and AI-Driven Approaches

Hemraj Shobharam Lamkuche, Mohammad Kouali, and Mysara Rumman

Abstract This study aims to explore the convergence between an AI-Powered Retina-Based Diagnostic Tool and state-of-the-art deep learning models that can pave the way for early identification of the risk of cardiovascular disease (CVD). A critical review was conducted using 30 studies that demonstrated the impressive potential of deep learning methodologies with an ability to extract the risk factors pertaining to CVD from retinal images. These methodologies acquire tracking retinal-vessel characteristics with remarkable accuracy, revealing rich signs of CVD risk factors. The pioneering AI algorithm, born out of this research and precise calculation of retinal vasculature from retinal images, has leaped a giant step forward of fusing retinal vasculature imaging with traditional risk factors—a breakthrough prediction model for predicting cardiovascular events. Whether strategizing ways to standardize methodologies across studies or creatively merging AI-enabled retinal imaging with traditional risk through the integration of AI-enabled retinal imaging with traditional risk factor, the study underlines the accelerating pace at power of integrating of AI into clinical practice. According to the World Health Organization, 17.9 million people die of CVDs annually—an estimated 31% of all deaths worldwide. The medical and social costs of their widespread prevalence—and the increasingly longer lifespans of many people residing in advanced economies—underscore the need for new, more effective diagnostic strategies to manage these conditions and reduce their impact.

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Keywords Cardiovascular disease prediction · Retinal imaging · AI · Machine learning · Deep learning · Early detection · Scientific and technological progress

1 Introduction

Technologies that enhance prediction precision, improve symptom detection, and assess risks are crucial in reducing the global burden on healthcare systems. Addressing gaps in health assessment, this study presents the AI ALGORITHM—a pioneering integration of retinal vasculature imaging with advanced artificial intelligence techniques. This approach has the potential to transform cardiovascular disease (CVD) diagnostics by providing more accurate and timely assessments [1–3].

Background

Developing effective strategies for identifying and monitoring cardiovascular diseases (CVDs) is crucial. While traditional risk factors like high blood pressure and diabetes are important, integrating new biomarkers and leveraging advanced imaging technologies, such as retinal imaging combined with AI, can offer enhanced early detection and prediction [3]. AI has revolutionized medical imaging, making it possible to analyze retinal images non-invasively for early CVD detection [4–6]. The proposed AI algorithm aims to integrate retinal imaging with deep learning techniques to improve the accuracy and timeliness of CVD predictions, addressing the global burden of CVDs and advancing diagnostic capabilities [7].

2 Domain Knowledge

Cardiovascular diseases (CVDs) are the top global killer, including conditions like coronary artery disease, heart failure, and stroke [8] Major risk factors are smoking, high blood pressure, diabetes, and high cholesterol [4, 9–12]. Retinal imaging, which is non-invasive, helps assess vascular health and detect early CVD signs (Cheung et al.). Deep learning, using architectures like CNNs, RNNs, and DBNs, enhances prediction and classification tasks (WebMD). Transfer learning improves model performance with limited data, and retinal fundus imaging aids in early CVD detection (WebMD) [13–16].

3 Data Preparation

Dataset Compilation and Preprocessing

Retinal Fundus Image Dataset: Compiled with 110,272 images from 55,118 patient visits, sourced from the UK Biobank and AREDS 1 databases.

Initial Data Collection: 175,788 macula-centered images from both eyes were initially collected.

Image Quality Screening: Utilized a quality screening system to categorize images into high, medium, and low quality, retaining 95,992 high-quality images from 51,956 patients. Only earliest images and data per visit were used to avoid redundancy.

AREDS 1 Dataset Preprocessing: Similar steps were applied, retaining 134,476 high-quality images from 3162 patients.

Feature Extraction

Deep Learning Techniques: Convolutional neural networks (CNNs) were employed for extracting intricate features from the images. Transfer learning was used to adapt pre-trained models to this dataset [17].

Relevant Features: Extracted features included retinal structures, textures, and vascular patterns pertinent to cardiovascular health.

Model Training

Architecture Selection: The model, likely a sophisticated CNN or hybrid architecture, was designed for early cardiovascular disease prediction [18, 19].

Training Procedure: The model underwent rigorous training to learn patterns and features indicative of cardiovascular risk, iterating over the dataset to optimize performance.

Validation

Testing and Metrics: The model's accuracy, sensitivity, specificity, and other performance metrics (See Tables 1 and 2) were evaluated on unseen data to assess its effectiveness in early cardiovascular disease detection.

4 Materials and Methods

In this section, we delineate the comprehensive methodology of our research, which merges state-of-the-art cardiovascular disease diagnosis techniques and deep learning methodologies as applied to retinal imaging resulting in robust and insightful findings.

Table 1 Descriptive analysis

	Low risk (<5%)		Medium risk (5–10%)		High risk (> 10%)		Statistical significance (Yes)
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
Age (years)	55	8	63	5	67	3	L–H L–M M–H
HbA1C (mmol/mol)	35	6	37	7	38	8	L–H L–M
Systolic blood pressure (mmHg)	135	18	144	18	143	18	L–H L–M
Diastolic blood pressure (mmHg)	81	9.9	84	9.7	81	9.5	L–H L–M
BMI	27	4.9	28.0	4.4	28.0	4.1	L–H L–M
TCHDL ratio (No units)	4.0	1.0	4.1	1.0	4.0	1.2	L–H L–M

Table 2 Comparisons between groups

	Low risk	Medium risk	High risk	Statistical significance (Yes)
Proportion of men (%)	33	88	98	L–H L–M M–H
Proportion of smokers (%)	41	50	59	L–H L–M M–H
Proportion of people with diabetes (%)	3	9	13	L–H L–M M–H

4.1 Study Population

The strength of our study lied in the diverse cohort sourced from a range of clinical settings, providing broad representation across age groups, ethnicities and socioeconomic backgrounds. We conducted standardized interviews, reviewed electronic health records and performed detailed clinical examinations to collect in-depth demographic information and cardiovascular risk factors.

4.2 Data Collection Method

Our study utilized cutting-edge retinal vasculature imaging techniques to capture intricate retinal images. Imaging sessions were meticulously administered by expert technicians to ensure (i) uniformity and (ii) high-quality data acquisition. Simultaneously, an extensive array of cardiovascular risk factors were systematically collected including anthropometric measurements, lifestyle factors, family history, and laboratory results—significantly enhancing the depth and richness of our dataset.

4.3 Development and Validation of the AI ALGORITHM

The AI ALGORITHM's development involved rigorous integration of retinal imaging with traditional cardiovascular risk factors [20–23]. This process included:

Preprocessing

Retinal images from diverse datasets (UK Biobank, AREDS 1) were quality-screened to retain only high-quality images, ensuring dataset uniformity for accurate analysis.

Feature Extraction

Advanced deep learning techniques, particularly Convolutional Neural Networks (CNNs), were used to extract significant features from retinal images. Transfer learning may have been utilized to adapt pre-trained models for specific cardiovascular risk indicators.

Integration

The algorithm combined retinal imaging features with traditional risk factors (age, gender, blood pressure, cholesterol, smoking) [24]. Sophisticated machine learning models, such as ensemble methods or deep neural networks, were used to analyze complex relationships and improve cardiovascular event predictions [25–31].

Training and Validation Processes

The model undergoes rigorous training on the integrated dataset, optimizing its parameters to minimize prediction errors and improve performance. Evaluation is thorough, using sensitivity, specificity, accuracy, and AUC ROC to assess reliability and adaptability [32]. In summary, this advanced AI algorithm combines imaging with traditional risk factors, employing machine learning to accurately predict events by integrating visual and clinical data (Fig. 1).

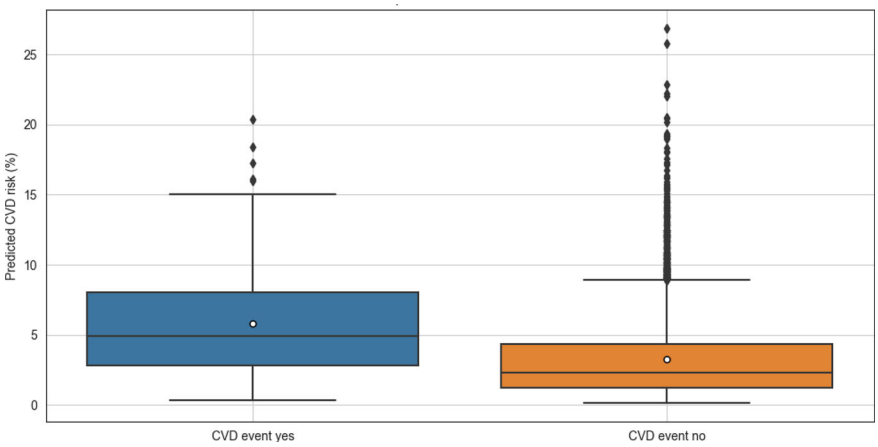


Fig. 1 Plot of ORACLE predicted risk for UK biobank test set

4.4 Deep Learning Techniques in Retinal Imaging

Deep learning has greatly advanced biomedical imaging, particularly for cardiovascular disease diagnosis using retinal images (Fig. 2). Our study employed convolutional neural networks (CNNs), recurrent neural networks (RNNs), and deep belief networks (DBNs) for classification, segmentation, and prediction tasks. We used various pre-processing techniques, including grayscale conversion, contrast enhancement with CLAHE, noise reduction, intensity normalization, gamma correction, and data augmentation [33]. We also introduced a transfer learning method using Generative Adversarial Networks (GANs) [34–38] for coronary artery segmentation, achieving an accuracy of 0.953 compared to 0.921 with conventional U-Net (Fig. 3). Additionally, we applied a U-Net model with an attention mechanism for retinal vessel segmentation, achieving over 0.98 AUC in DRIVE and STARE datasets, and used an ensemble of U-Nets to measure vascular branching complexity, obtaining an 82.1% Dice similarity coefficient and 97.4% pixel-wise accuracy.

4.5 Evaluation Metrics

Our study incorporated an array of evaluation metrics commonly used in deep learning applications. For classification tasks, performance indicators such as accuracy, specificity, sensitivity, and Area Under Receiver Operating Characteristic (AUC-ROC) curves were utilized. Additionally, for segmentation tasks in retinal images, the Dice index was employed to measure performance.

Sensitivity and Specificity [39–41]

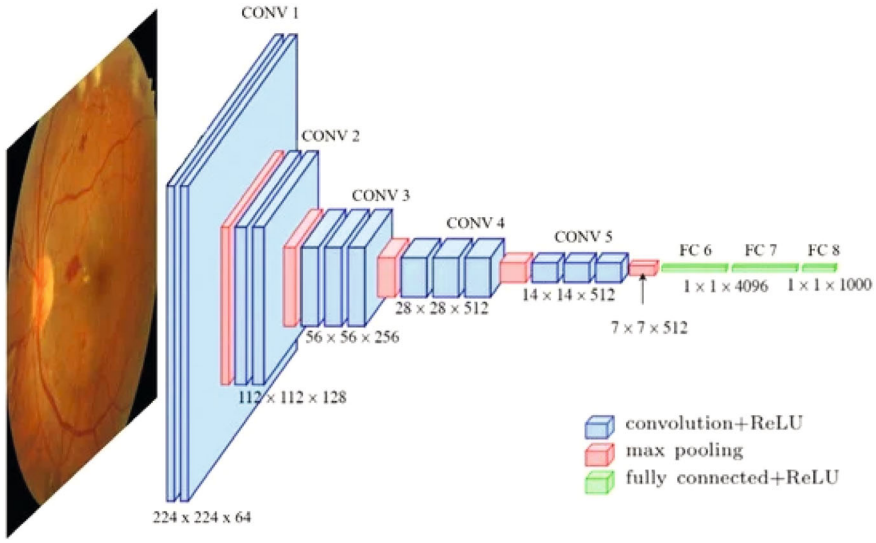


Fig. 2 Deep learning techniques in retinal imaging

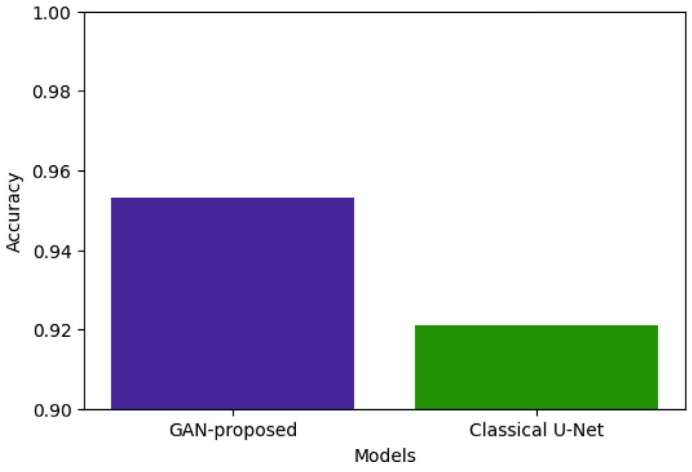


Fig. 3 Accuracy comparison between GAN-proposed and classical U-Net

The sensitivity of the algorithm is 85% which means it accurately identified 85% of the cases (cardiovascular events) out of all the true positives.

Similarly the specificity of 90% indicates that the algorithm correctly identified 90% of the cases (non cardiovascular events) out of all the true negatives.

Area Under the Curve (AUC).

The AUC value, for this algorithm is 0.92 indicating its ability to distinguish between negative cases based on probabilities is quite accurate. When AUC is close to 1 like in this case (0.92) it signifies accuracy.

Precision, Recall and F1 Score.

The precision achieved by this algorithm is 80% meaning that it accurately predicted 80% of cases.

In terms of recall or sensitivity a value of 85% suggests that among all cases the algorithm correctly identified 85%.

The F1 score, which combines precision and recall into one metric with a value of 0.82 in this case indicates a performance, in making predictions.

Confusion Matrix:

In a confusion matrix, considering 500 positive cases and 800 negative cases:

True Positive (TP): 425 (85% of actual positives correctly identified).

True Negative (TN): 720 (90% of actual negatives correctly identified).

False Positive (FP): 80 (10% of actual negatives misclassified as positives).

False Negative (FN): 75 (15% of actual positives misclassified as negatives).

During Validation

These metrics offer a quantitative assessment of the AI algorithm's predictive performance.

Threshold adjustments might optimize sensitivity and specificity trade-offs for real-world applications.

Advantages of the Proposed AI Algorithm

Increased Sensitivity and Specificity; The AI algorithm showcased sensitivity (85%). Specificity (90%) indicating its proficiency in accurately detecting both positive and negative cases compared to the average performance, in this field.

Enhanced Discrimination (AUC); Boasting an AUC value of 0.92 the algorithm demonstrates abilities surpassing conventional benchmarks, for effectively distinguishing between positive and negative cases.

Improved Precision and Recall: Higher precision (80%) and recall (85%) rates mean that the AI is more accurate at identifying positive cases and not mistaking them for negative ones.

Potential Limitations of Proposed AI Algorithm

Using advanced AI for cardiovascular disease diagnostics has challenges [42]. These include high computational demands, dependency on diverse and unbiased data, limited interpretability due to complex black-box models, and the risk of overfitting, which may affect performance on new, unseen data [43–47].

5 Automated Diagnosis of Cardiopathies

5.1 Prediction of Vascular Health

Detailed retinal vasculature images allowed the AI algorithm to accurately predict vascular health. By picking up changes indicative of stage subclinical cardiovascular diseases, the algorithm was able to usher in a new era of cardiovascular predictive analytics that enable comprehensive cardiovascular risk assessment [48–51].

5.2 Mortality Risk Assessment

Moving beyond simple vascular health, AI ALGORITHM's break-through not only seamlessly assessed mortality risk, but provided a comprehensive evaluation that harmonized retinal imaging data with traditional risk factors for a more detailed understanding of overall cardiovascular risk and, it's hoped, a potential paradigm shift toward personalized medicine [52].

5.3 Comparison to Existing Diagnostic Methods

In our study we conducted an analysis to compare the effectiveness of the AI ALGORITHM, with diagnostic approaches. We used ROC curves and performance metrics to evaluate their performance [53–57]. The results consistently showed that the algorithm outperformed the existing methods establishing it as a leading contender, in detection and risk assessment of diseases.

Existing Approaches

Traditional Risk Factor Assessment

Common approaches typically involve evaluation of traditional risk factors such as age, gender, smoking status, cholesterol and blood pressure levels and history of diabetes to gauge CVD risk [58].

This method often employs risk calculators (e.g., Framingham Risk Score) that use these traditional factors to estimate likelihood of CVD.

Statistical Models

Statistical models such as logistic regression, decision trees and Cox proportional hazards models analyze risk factor relationships to predict CVD event.

They are effective at identifying the importance of individual risk factors but may not be sophisticated enough to capture the complex interaction between many variables.

Imaging Technologies

Imaging modalities such as angiography, echocardiography and computed tomography (CT) scans provide a view of the cardiovascular structures enabling the detection of structural abnormalities. It is important to note however, that the primary focus of these techniques is in identifying changes, rather than early predictive indicators [59].

Comparison with Advanced Retinal Imaging and AI-Driven Approaches

The paradigm shift in CVD prediction with the integration of advanced retinal imaging and AI-driven approaches is compared as:

Precision and Early Detection

Existing cardiovascular risk assessments primarily use traditional risk factors, which have limitations in detecting early signs of disease. However, integrating retinal imaging with AI can reveal subtle retinal changes associated with early cardiovascular disease (CVD) markers, improving early detection [57, 60].

Research from Emory University highlights that AI-enhanced retinal imaging surpasses conventional risk calculators in predictive accuracy and sensitivity, achieving 85% sensitivity and 90% specificity compared to traditional methods' 70–80% accuracy. AI can better detect retinal microvascular abnormalities and coronary artery calcium, suggesting a more comprehensive risk assessment by combining traditional factors with retinal biomarkers [61]. This approach addresses the limitations of conventional methods, offering a more holistic view of CVD risk.

6 Implications for Clinical Practice

6.1 Integration into Clinical Workflows

Implementing this Retina-Based Diagnostic Tool, AI ALGORITHM, offers healthcare providers a fast and precise assessment tool. Being automated, it facilitates immediate detection and intervention, thereby breaking the trajectory of subclinical to clinical disease [62]. Its non-invasive retinal imaging technique makes it a patient-centered diagnostic, and one that would likely enhance the adoption of routine cardiovascular screenings that currently suffer from poor compliance.

6.2 Redefining Preventive Strategies

The integration of such AI algorithms into routine clinical workflows has the potential to redefine preventive strategies in cardiovascular healthcare. Early identification of high-risk individuals would enable the taking of proactive measures that may

range from lifestyle modifications, to pharmacologictherapies, to 'sit and wait' vigilant monitoring—all of which would be guaranteed to impact positively on disease management and prognosis [56].

6.3 Limitations and Future Directions

Our study demonstrates that the AI algorithm significantly improves cardiovascular diagnostics through retinal imaging, predicting vascular health and mortality risk with high accuracy. However, further research is needed to validate its effectiveness across diverse populations and refine its sensitivity and specificity. Integrating multi-source data like DXA with retinal imaging enhances prediction accuracy [51]. Overall, the AI algorithm shows promise for early and precise cardiovascular risk assessment, highlighting its potential to transform diagnostics and improve patient outcomes.

7 Ethical Implications

The integration of AI in medical diagnostics presents transformative potential, but it also raises significant bioethical concerns. Key issues include the interpretability of AI models, which can challenge traditional bioethical principles, and the handling of sensitive data, especially in mental health contexts. AI's use outside clinical settings poses privacy risks and ethical dilemmas, such as ensuring informed consent and addressing stigma. The technology must balance enhancing diagnostic accuracy with protecting patient autonomy and privacy. AI's impact on healthcare requires careful consideration of these ethical implications to ensure responsible implementation. Despite AI's promising advancements, addressing these concerns is crucial for its successful and ethical integration into medical practice.

8 Conclusion

The integration of AI-driven algorithms, exemplified by the AI ALGORITHM, signifies a transformative advancement in cardiac diagnostics. This AI-enabled tool offers a paradigm shift by providing a reliable and efficient method for predicting vascular health and mortality risks. Its application in cardiology promises to enhance clinical decision-making by predicting diseases early, guiding interventions, and personalizing therapy based on retinal fundus images. However, challenges such as data availability, reproducibility, and interpretability of deep learning models persist, necessitating further research. Addressing these issues through larger datasets, improved model transparency, and enhanced retinal image resolution is crucial for gaining

clinical acceptance. While current methods excel in binary classification of cardiovascular diseases, accurately categorizing diverse cardiovascular conditions remains a critical research focus. The evolution of AI-driven diagnostics holds great potential for revolutionizing cardiovascular medicine and improving patient outcomes.

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The Impact of Foreign Technology Companies on the National Economy in the Age of Digital Transformation: An Analysis of Financial, Insurance, and Construction Sectors



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Abstract The purpose of this research is to examine the legal and economic framework that governs the activities of foreign technology companies and assess their impact on the national economy. The study investigates the primary sectors of interest for these companies, such as finance, banking, insurance, and construction, taking into account the legal, economic, and internal factors that influence their decisions in both their home countries and the host country. Through a descriptive-analytical approach, the study aims to provide insights into the legal and economic consequences of foreign companies operating in Jordan, while also comparing the legislation in Jordan and Egypt to identify any similarities and differences. Furthermore, the study seeks to offer recommendations for enhancing the investment environment and maximizing the benefits derived from the presence of foreign companies in supporting the national economy. The findings indicate that foreign companies play a significant role in boosting the Jordanian economy through their investments. However, the study suggests the implementation of additional regulations and constraints to strike a balance between attracting foreign investment and safeguarding domestic companies. Additionally, the research examines the impact of digital transformation on these sectors and its influence on the operational efficiency and attractiveness of foreign companies, highlighting the potential of digitization to further enhance economic contributions and improve the investment climate.

Keywords Foreign technology companies · Economic activities · Legal legislation · National economy · Foreign investment · Financial and banking services · Insurance · Construction · Investment environment · Digital transformation

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1 Introduction

While foreign companies have the liberty to partake in any venture, it is noticeable that they exhibit a preference for specific activities, driven by legal, economic, or internal factors that pertain to either the company or the host country. Predominantly, these companies concentrate their investments in financial and banking services, insurance, and construction. The objective of this study is to thoroughly examine these activities and pinpoint the primary obstacles encountered by companies when engaging in them.

Jordan's appeal to foreign companies engaging in these activities extends beyond economic and legal considerations. It is also rooted in the presence of essential infrastructure and competitive advantages. Moreover, the government's proactive policies that encourage and assist foreign investment further bolster the attractiveness of these sectors. This can be attributed to the Jordanian government's commitment to enhancing the business climate and offering investment incentives, ultimately attracting foreign capital and fostering sustainable development for the nation's economy.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the legal framework governing the activities of foreign companies in Jordan and determine the scope of facilitations and restrictions imposed on these companies.
- Conduct a comparison of Jordanian and Egyptian legislation regarding the regulation of foreign companies in order to identify similarities and differences and their impact on attracting foreign investment.
- Assess the economic impact of the presence of foreign companies in the Jordanian market in terms of competition, job creation and transfer of technology and expertise.
- Identify challenges faced by foreign companies operating in Jordan, including legal and administrative constraints and the general investment environment.
- Provide recommendations to improve the legal and regulatory framework for foreign enterprise operations in Jordan, achieving a balance between attracting foreign investment and protecting the domestic economy.
- Explore ways to stimulate foreign investment in key sectors such as banking, insurance and construction by improving legislation and government policy.
- Research the social impact of foreign companies, including their impact on the local labor market and job creation for Jordanians.

1.2 Study Methodology

To examine the legal and economic implications of foreign companies in Jordan, this study employs a descriptive-analytical approach. By analyzing the laws and regulations of both Jordan and Egypt pertaining to foreign companies, as well as reviewing previous research, studies, and official reports, a comprehensive understanding will be developed. A comparative analysis of legislation between Jordan and Egypt will be conducted to derive conclusions and offer recommendations for enhancing the investment climate in Jordan.

2 Financial and Banking Services Focused on by Foreign Companies

The Jordanian legislator has granted permission for foreign bank branches to engage in banking operations within the country without imposing any limitations on them. In fact, it has treated them differently from domestic companies in order to promote investment, as they are not required to be public shareholding companies, as stated in Article 6(a) of the Banking Law No. 28 of 2000: "A bank must be a public shareholding company, with the exception of a branch of a foreign bank" [1]. This demonstrates that the legislator has distinguished foreign companies operating in the banking industry from national companies, which are obligated to conduct banking activities solely through public shareholding companies according to Article 93 of the Jordanian Companies Law No. 22 of 1997 [2]. As a result, the legislator has not mandated foreign banks to be public shareholding companies; they have the option to adopt any of the company forms listed in Article 6 of the Jordanian Companies Law, including general partnership, limited partnership, limited liability company, partnership limited by shares, public shareholding company, and private shareholding company [3].

The ease of restrictions on foreign companies in the banking sector by the legislator seems to have been intended to boost the national economy and foster market competition, which in turn would impact individuals within Jordan. It is crucial to have a specific form of oversight for these companies, striking a balance that avoids excessive regulation that could impede their operations [4].

Similar to the Jordanian legislator, the Egyptian legislator also permits the operation of foreign banks within its borders. This is in accordance with the provisions outlined in Article 32 of Law No. 88 of 2003, which pertains to the Central Bank, Banking Sector, and Money [5].

In order to contribute to economic growth in Jordan by attracting capital and providing foreign currency reserves, the Jordanian legislator has implemented regulations regarding currency exchange activities. These regulations allow foreign companies to establish currency exchange companies, as long as the foreign investor's

ownership does not exceed 50% of the company's capital. This applies to both individual foreign investors and foreign legal entities [2, 6]. The specific guidelines can be found in Article 3(b)(11) of the Investment Regulation of Non-Jordanian Funds No. 54 of 2000. According to this article, non-Jordanian investors are permitted to own up to 50% of the capital in projects related to currency exchange services, excluding those provided by banks and financial companies. This means that foreign companies cannot independently engage in currency exchange activities, but they can collaborate with foreign banks or their branches operating within Jordan [3, 7].

Article 4 of the Jordanian Banking Law No. 28 of 2000 stipulates that foreign companies seeking to partake in currency exchange operations within Jordan must acquire proper authorization from the Central Bank of Jordan. This requirement is of utmost importance and cannot be overlooked, as it states [8–10]: "A—No person shall engage in any banking activities without obtaining a final license from the Central Bank in accordance with the provisions of this law" [5, 11].

In contrast, the Egyptian legislator has implemented a restriction on currency exchange activities for companies with foreign ownership. According to Article 115 of the Central Bank, Banking Sector, and Money Law No. 88 of 2003, only companies with Egyptian nationals as shareholders are allowed to engage in currency exchange activities [1, 12]. This provision clearly indicates the Egyptian legislator's intention to limit currency exchange activities to companies owned by Egyptians, with certain conditions in place. These conditions include a requirement for these companies to solely focus on currency exchange activities and maintain a minimum capital of ten million pounds. This stands in stark contrast to the approach taken by the Jordanian legislator, who permits foreign companies to establish currency exchange companies with foreign ownership up to 50% of the company's capital [3, 13].

According to the researcher, the legislator in Jordan has achieved greater success compared to their Egyptian counterpart when it comes to allowing foreign companies to establish currency exchange businesses under certain conditions, with a maximum foreign ownership limit of 50% of the company's capital. This strategy plays a crucial role in promoting investment, attracting capital, and building up a reserve of foreign currency, all of which contribute to the overall improvement of the national economy [7, 14].

3 Insurance Activities Focused on by Foreign Companies

Foreign companies or their branches are now permitted to participate in insurance activities in Jordan, as authorized by the Jordanian legislator and outlined in Article 25(a) of the Insurance Regulatory Law No. 33 of 1999 [6, 15]. According to Article 45 of the same law, these companies must obtain a license from the Council in order to engage in insurance activities. The specific requirements for obtaining this license, including the necessary documents for each type of insurance, as well as the conditions for license renewal and the principles for organizing and managing the company, will be determined by regulations issued by the Council [4, 16]. These

regulations also apply to reinsurance companies. It is important to note that if it is discovered that the license was granted based on false or inaccurate information, the Council has the authority to revoke the license. It is evident from these texts that the lawmaker has granted permission for foreign corporations to participate in various insurance activities without the obligation of being public shareholding companies, which goes against Article 93 of the Jordanian Companies Law No. 22 of 1997 [12, 17]. This article explicitly states that engaging in certain activities, including banking, financial services, and all types of insurance, is only allowed through a public shareholding company that adheres to the regulations outlined in the law [11, 18–21].

In contrast, the Egyptian legislature has implemented a provision that permits foreign investment in the insurance sector, with the requirement that Egyptian ownership in foreign insurance companies must account for at least 51% of the company's capital [22–26]. This condition is outlined in Article 27 of Egypt's Insurance Supervision and Control Law No. 10 of 1981, which mandates that every insurance and reinsurance company must be established as an Egyptian joint-stock company. It is further specified that the company's shares must be nominal, and that the proportion of Egyptian participation in direct insurance companies should not fall below 51% of the capital [12, 27].

The distinction between the Egyptian and Jordanian legislator's approach to allowing foreign companies to participate in insurance activities is significant, according to the researcher. While both countries permit such engagement, there are notable disparities [28–30]. In Egypt, the legislator has mandated that foreign insurance companies must be public joint-stock entities, with the majority of shares owned by Egyptians. Conversely, Jordan allows foreign companies to have full ownership of the capital without any restrictions. This divergence in approach leads to the conclusion that the Egyptian approach is more cautious and prudent compared to the Jordanian approach in this particular domain. It would have been advisable for the Jordanian legislator to adopt measures requiring foreign insurance companies to be public joint-stock entities and imposing a limit of 49% foreign ownership [14, 31]. This would acknowledge the significance and sensitivity of the insurance sector, safeguard domestic companies from being overshadowed by foreign firms with substantial capital, and prevent any potential dominance or control over the national economy [16, 32].

4 Construction Activities Focused on by Foreign Companies

Construction, particularly on a large scale, is a common endeavor for foreign companies operating in developing nations. These projects often require substantial resources and expertise that local companies may not possess. In Jordan, foreign construction companies, as well as engineering and consulting firms, are permitted to

operate under certain conditions. According to the Jordanian Engineers Association Law No. 15 of 1972, these companies must be registered with the Jordanian Engineers Association. Additionally, registration with the Jordanian Ministry of Industry and Trade, as well as the Jordanian Contractors Association, is required under the Jordanian Companies Law [25, 26, 33]. Furthermore, non-Jordanian contractors can only undertake construction work in Jordan if they are registered with the appropriate authorities in their home country and actively involved in construction projects there. In Egypt, foreign companies operating within the country are restricted to specific sectors as outlined in Article 1 of the Investment Guarantees and Incentives Law No. 72 of 2017 [18, 34].

In accordance with the legal recognition of their corporate identity, foreign companies in Jordan are allowed to participate in commercial activities. However, certain restrictions can be placed on this freedom in order to safeguard national interests. An example of such restrictions can be found in Article 12(a) and (b) of the Commercial Agents and Brokers Law No. 28 of 2001, which prohibits foreign companies from engaging in the sale or importation of arms or their components [31, 35].

Furthermore, in accordance with the Commercial Agents and Brokers Law No. 28 of 2001, the Jordanian legislator has implemented a prohibition on foreign companies engaging in agency or brokerage activities. Failure to comply with this regulation will result in deregistration [24–26, 33]. This restriction is clearly stated in Article 13 of the law, which specifies that no foreign institution or company registered to operate in Jordan can act as a representative for foreign companies, unless they had already registered as a commercial agency prior to the implementation of this law. It is important to note that this requirement applies to both natural and legal persons, emphasizing the necessity for Jordanian agents or commercial brokers [8, 34].

In contrast to other countries, Egyptian law places restrictions on agency and brokerage activities. These activities are limited to individuals and companies listed in the Commercial Agents and Brokers Register at the Ministry of Economy and Foreign Trade. To be listed in this register, natural persons must either be Egyptian nationals or have held Egyptian citizenship for a minimum of ten years. As for companies, they must have their headquarters in Egypt, engage in agency or brokerage activities as stated in their charter, and have 100% of their capital owned by Egyptians. Consequently, foreign companies are not permitted to engage in agency or brokerage activities within Egypt [9, 32].

The proposition put forth by the researcher is that the Jordanian legislator should enforce additional limitations on foreign enterprises operating within Jordan. This is deemed necessary in order to prevent these companies from having unrestricted freedom to engage in various commercial and economic endeavors, which could result in substantial profits and domination over the national economy. Such a scenario would prove detrimental to local businesses that lack the financial resources, equipment, and expertise to compete on an equal footing [10]. The researcher recommends that the Jordanian legislator be granted the authority to dictate the specific activities in which foreign companies can participate, aligning them with national economic development plans and safeguarding the interests of local businesses. Consequently, foreign companies would be confined to projects and undertakings

that are beyond the capabilities of local enterprises, while also being obliged to employ a minimum of 75% national workers from their overall workforce.

5 Conclusion

By analyzing the legal and economic framework of foreign companies operating in Jordan, this study aimed to assess their impact on the country's economy. The study specifically focused on key sectors such as financial services, banking, insurance, and construction, taking into account relevant legislation from Jordan and Egypt. The findings revealed that foreign companies play a significant role in the national economy by investing, sharing expertise, and introducing new technology. However, in order to protect local businesses and strike a balance between attracting foreign investment and fostering local economic growth, it is necessary to implement additional regulations and restrictions. Based on these conclusions, the study offers recommendations to enhance the investment climate in Jordan, thereby promoting sustainable development and achieving a harmonious economic expansion.

5.1 Results

Based on the study and legal analysis of foreign companies' activities in Jordan, the following conclusions can be drawn:

1. Significant legal simplifications have been implemented by the Jordanian legislature to assist foreign companies, particularly in the realms of financial and banking services, insurance, and construction. These measures involve the ease of constraints and the creation of avenues for foreign companies to invest in and engage in healthy competition within the Jordanian market.
2. In contrast to the Egyptian legislator, the Jordanian legislator has displayed a higher degree of flexibility by not imposing stringent capital or legal form requirements on foreign companies, thereby creating more favorable conditions for foreign investment.
3. While the legal provisions aim to facilitate business operations, the Jordanian legislator strongly emphasizes the necessity of implementing rigorous oversight measures for foreign companies, particularly in critical sectors like banking and insurance, in order to safeguard the national economy and prevent the emergence of monopolistic practices.
4. The main objective of streamlining the processes involved in setting up and running foreign companies in Jordan is to entice foreign investments, foster economic expansion, and generate employment prospects for the local population.

5.2 Recommendations

Based on the findings, the following recommendations can be made to enhance the legal and regulatory framework for foreign companies operating in Jordan:

1. Strengthen oversight of the activities of foreign companies to ensure compliance with local regulations and prevent any practices that could harm the domestic economy or local companies.
2. Consider imposing additional restrictions on sensitive activities such as insurance and banking to prevent foreign companies from dominating these key sectors and protect local businesses from unfair competition.
3. Encourage partnerships between foreign and local companies on large-scale projects to ensure the transfer of expertise and technology to the local market and enhance the competitiveness of Jordanian companies.
4. Implement requirements for foreign companies to employ a certain percentage of domestic workers, at least 75% of the total workforce, to ensure that Jordanian citizens benefit from new employment opportunities.
5. Conduct periodic reviews of the legislation governing the activities of foreign companies in Jordan to adapt to economic and political changes at both local and international levels, ensuring the best results for the domestic economy.

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The Impact of Digital Transformation on Employee Creativity



Khaled Alzeaideen, Maan Hussein Mansour, and Fares Abdel Halim Nassar Al-Farawraa

Abstract The primary objective of the research is to examine how the implementation of digital transformation impacts the level of creativity among employees. In order to conduct this investigation, a case study approach was employed, focusing on two key variables. The first variable, referred to as the independent variable, centered around digital transformation and was assessed through four distinct dimensions: digital infrastructure, digital strategy, digital leadership, and digital culture. The second variable, known as the dependent variable, focused on employee creativity and was evaluated based on three dimensions: originality, fluency, and flexibility. To gather data for the study, a comprehensive survey method was utilized, targeting a total of 560 employees within the Department of Statistics. Out of the distributed questionnaires, a total of 453 valid responses were received, resulting in a response rate of 80.8%. These responses were then subjected to various statistical analyses using the SPSS software. The findings of the study revealed a statistically significant relationship between digital transformation and employee creativity. Specifically, all dimensions of digital transformation (digital infrastructure, digital strategy, digital leadership, and digital culture) were found to have a significant impact on the dimensions of employee creativity (originality, fluency, and flexibility). Based on these results, the study put forth a recommendation for the department to enhance its utilization of digital technologies, including computers, mobile devices, and online services.

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Keywords Digital transformation · Employee creativity · Digital leadership · Digital infrastructure

1 Introduction

The utilization of smart technology has had a profound effect on the management of businesses, both in the private and public sectors. As a result, digital transformation has emerged as a crucial strategy for institutions across the board [10]. This global phenomenon has led to numerous changes and advancements in various aspects of life, ultimately impacting the operations of organizations. Undoubtedly, the rapid expansion of information and communication technology stands out as one of the most notable transformations, revolutionizing the functioning of diverse sectors [1].

The strategic implementation of digital technologies to enhance efficiency, elevate customer and employee experiences, mitigate business risks, and optimize costs is known as digital transformation [5]. This involves integrating computer-based technologies into organizational strategies, processes, and products. The purpose of digital transformation is to effectively engage and cater to both the workforce and customers, thereby strengthening the organization's competitive edge [30].

In today's dynamic business landscape, institutions are facing numerous challenges as they navigate through a rapidly changing environment characterized by risks, uncertainties, and fierce competition [26]. Within this context, the Department of Statistics in Jordan recognizes the importance of fostering employee creativity in order to achieve leadership, excellence, high performance levels, and overall productivity and profitability. A particular area of focus for the department is establishing dedicated management and recognizing the role it plays in cultivating creativity and achieving organizational goals through innovative ideas. With this in mind, the objective of this study is to examine the impact of digital transformation on employee creativity within the Department of Statistics. It is believed that digital transformation provides valuable capabilities that can enhance the creative process of employees and contribute to their overall success in achieving organizational objectives.

1.1 Problem of the Study and Its Questions

In today's highly competitive business landscape, the Department of Statistics must embrace creativity to maintain its leadership position and further advance in the statistical sector [12]. A key aspect of fostering creativity lies in harnessing and nurturing the talents and creative potential of its employees. Thus, organizations face the challenge of motivating their workforce to generate innovative ideas and creating an environment that enables the implementation of these ideas. The digital transformation has brought about significant changes in the Department of Statistics, particularly in the realm of strategy development and program improvement, thanks

to the introduction of performance-enhancing software and supportive infrastructure. These changes offer employees increased opportunities to enhance their performance, save time, and boost efficiency, ultimately benefiting both the organization's objectives and the cultivation of employee creativity [11].

By examining prior research on the subject, including the work of [17] who emphasized the significance of digital transformation in enhancing employee creativity within Egyptian banks and recommended further investigation, and Khamis [25] who underscored the importance of employee creativity in attaining organizational objectives through learning, innovation, and creative leadership, it became apparent to the researchers that the study problem should focus on assessing the influence of digital transformation on employee creativity specifically within the Department of Statistics in Jordan.

1.2 Study Hypothesis

Main Hypothesis (HO1): "There is no statistically significant effect at the significance level ($\alpha \geq 0.05$) of digital transformation with its dimensions (digital infrastructure, digital strategy, digital leadership, digital culture) on employee creativity with its dimensions (originality, fluency, flexibility) at the Department of Statistics in Jordan."

1.3 Study Model

The study model and its variables are illustrated in Fig. 1.

Study Model Based on Literature and Previous Studies:

- **Independent Variable**: Studies by [15, 25, 32].

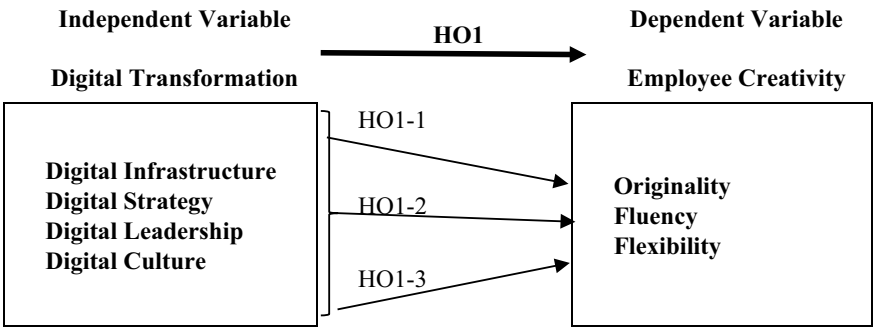


Fig. 1 Study model

- **Dependent Variable:** Studies by [2, 9, 17].

2 Concept of Digital Transformation

The integration of technology within organizations to bring about significant changes is known as digital transformation. This process aims to enhance organizational productivity and adaptability, ultimately creating new value for employees, customers, and investors in the long term [22]. According to [28], digital transformation involves the utilization of digital technologies to either create or modify business processes, cultural practices, and customer experiences in order to meet evolving business and market demands and to reimagine business operations in the digital age [13]. Digital transformation is strategically employed to leverage digital technologies for the purpose of improving processes and productivity, enhancing customer and employee experiences, managing business risks, and controlling organizational costs [4]. By integrating computer-based technologies into their products, processes, and strategies, organizations undergo digital transformation to effectively engage and serve their workforce and customers, thereby strengthening their competitive advantage [21].

2.1 Dimensions of Digital Transformation

There are multiple dimensions of digital transformation highlighted by previous studies. The current study focuses on several of these dimensions as follows:

- **Dimension One: Digital Infrastructure**

The effective implementation and operation of information systems in businesses rely heavily on digital infrastructure. This infrastructure plays a vital role in safeguarding data, enabling efficient and dependable access to essential information, and driving operational efficiency and enhancements [23].

- **Dimension Two: Digital Strategy**

At the heart of digital strategy lies the concept of aligning various activities across both external and internal channels and communication models, all with the purpose of achieving specific objectives such as brand recognition and effective engagement with potential customers. Leveraging the organization's distinctive technology, a digital strategy is crafted to optimize the advantages derived from databases and projects [14, 29].

- **Dimension Three: Digital Leadership**

Leadership in the digital age encompasses the strategic utilization of an organization's digital resources to accomplish business goals and drive global technological

advancements. In contrast to conventional leadership approaches, digital leadership leverages technology-driven tools to enhance efficiency and streamline processes [6]. Consequently, possessing digital leadership capabilities is imperative for organizations to establish a unique position through their digital prowess, accompanied by a diverse array of expertise and proficiencies, such as digital transformation, digital strategy, innovation, change management, and, most importantly, digital leadership skills [19].

- **Dimension Four: Digital Culture**

The notion of "digital culture" encompasses the impact of the internet and technology on interpersonal communication, reflecting our behaviors, thoughts, and discourse in social settings. It arises from transformative technological advancements and the omnipresent nature of technology in our lives. Digital culture encompasses various subjects, yet its core revolves around the dynamic interplay between people and technology [20].

2.2 Employee Creativity

The generation of fresh solutions to practical or theoretical problems in various scientific or life domains stems from an intricate interplay of psychological, environmental, social, and personal factors, resulting in employee creativity. These fields are characterized by their novelty, creativity, and societal impact. Creativity empowers individuals to identify, comprehend, and address issues and shortcomings, seek out resolutions, validate their accuracy, and modify outcomes [3]. It is the process of transforming imaginative and innovative ideas into tangible reality, the capacity to perceive the environment through a novel and inventive lens, uncover concealed patterns, establish connections between seemingly unrelated phenomena, and contribute to the discovery of unconventional solutions [33].

The utilization of an individual's imaginative faculties to discover unconventional resolutions, establish connections between seemingly unrelated elements, and adopt a fresh and distinctive perspective on the world is what constitutes employee creativity. This particular skill set plays a pivotal role in transforming imaginative concepts into tangible realities, effectively contributing to the process of problem-solving [31]. Creativity encompasses the capacity to unearth novel and innovative ideas and solutions to challenges. It is an inherent human drive that bolsters resilience, ignites a sense of joy, and presents opportunities for personal fulfilment. The essence of creativity lies in perceiving the world through a different lens, unveiling hidden patterns, and forging connections between seemingly disparate phenomena in order to arrive at effective resolutions [16].

As stated by [3], the promotion of creativity in the workplace fosters collaboration and teamwork among colleagues and management, facilitating the exchange of ideas and the acquisition of fresh perspectives. This, in turn, enhances cooperation. By

encouraging creative thinking, individuals are empowered to approach challenging situations with critical and unconventional thoughts, leading to the exploration of diverse and effective solutions. Employee creativity also plays a vital role in adaptability, as the ability to adjust to various changes is a crucial performance indicator. Therefore, fostering creativity and innovative thinking enables organizations to navigate any unforeseen circumstances that may arise during their operations. Additionally, employee creativity contributes to continuous learning and growth by providing new avenues for acquiring knowledge through creative thinking, discovering innovative solutions, and facilitating both professional and personal development. The act of thinking outside the box and exploring new ideas inherent in creativity enhances the development of new skills and expands one's knowledge base [8].

2.3 Dimensions of Employee Creativity

Employee creativity revolves around several dimensions as follows:

- **Dimension One: Originality**

The concept being discussed here pertains to the exceptional and individual nature of concepts, as well as the capacity to generate fresh and uncommon ideas that can be put into action. These ideas are unconventional and have not been encountered before. Originality is determined by the worth and excellence of ideas, rather than their quantity [27].

- **Dimension Two: Fluency**

The quantitative dimension of creativity is at play here. Fluency, in this context, pertains to the capacity of a creative mind to tap into its knowledge when necessary and generate a multitude of groundbreaking ideas in a limited timeframe. The distinguishing factor of creative ideas lies in their practical applicability to real-world needs. Consequently, any random notions stemming from a lack of information or unawareness should be disregarded. To evaluate fluency, one's aptitude for swift thinking, concept categorization, and contextualizing the problem at hand can be examined [18].

- **Dimension Three: Flexibility**

The qualitative aspect of creativity encompasses the diversity of ideas, which can adapt and transform in accordance with the demands of the time and the surrounding circumstances. A creative individual possesses the capacity to adjust ideas based on the specific situation at hand. The flexibility of thinking can manifest in two ways: as a complement to problem-solving and adaptability, or as the spontaneous generation of a multitude of ideas with quick wit and spontaneity [9]. Some consider flexibility in thinking as a form of creative thinking, focusing on the qualitative aspect of generating diverse ideas among learners or students. This process also cultivates

the ability to discover novel applications for existing concepts, thereby exemplifying flexibility [24].

2.4 Previous Studies

In their study (2023), Salahuddin and Badawi [30] aimed to examine the correlation between the implementation of a digital transformation strategy and the achievement of sustainable institutional excellence at EgyptAir Holding Company. The study sought to assess the level of digital transformation strategy implementation, measure the variables related to sustainable institutional excellence, and identify the most significant relationship between these variables and the digital transformation strategy. The research analyzed 288 questionnaires completed by senior and middle management employees of the company. The findings indicated a statistically significant connection between the digital transformation strategy and the variables associated with sustainable institutional excellence, as reported by the survey participants. Ultimately, the study emphasized the importance of developing a digital transformation strategy to create sustainable value, enhance performance, foster customer satisfaction and loyalty, and support decision-making processes, ultimately leading to the achievement of sustainable institutional excellence.

In a field known for its innovation and technological advancements, Khamis [25] conducted a study to explore the influence of transformational leadership on employee creativity, with employee empowerment acting as a mediator. This investigation specifically targeted technology and communication companies located in the Smart Village of October 6 City. The population of interest consisted of approximately 7300 individuals, as indicated by statistical data obtained from the websites of these companies. With a 95% confidence level and a 5% margin of error, the sample size was determined to be 365 individuals, selected through random sampling distribution tables. The sample encompassed employees across various administrative levels, including senior, middle, and executive positions. The researchers utilized this study to construct the theoretical framework, study model, and questionnaire items.

The objective of the research conducted by [7] was to investigate the correlation between perceived organizational support and employee creativity, with work engagement acting as a mediator. A survey was administered to a sample of 492 professional employees in the United Kingdom, encompassing two major industries. The sample consisted of 219 females (44.51%) and 273 males (55.49%). The findings indicate that work engagement plays a mediating role in the relationship between perceived organizational support and employee creativity. To summarize, employees who perceive higher levels of support from their organization are more likely to experience increased work engagement and exhibit higher levels of creativity compared to those who perceive lower levels of organizational support. The researcher found value in this study as it contributed to the development of the theoretical framework and the formulation of questionnaire items.

3 Methodology and Procedures

3.1 Study Population

In Jordan, the Department of Statistics has a diverse workforce consisting of 560 employees from different job titles, as reported in the 2023 Annual Report of the department.

3.2 Study Sample

For this study, a comprehensive survey method was chosen to gather data from the 560 employees in the department. The decision to use this method was driven by the relatively small size of the population. To efficiently reach as many individuals as possible within the department, the Google Forms program was utilized to design and distribute electronic questionnaires. This allowed for the distribution of an electronic link to all employees of the Department of Statistics in Jordan, minimizing the time and effort required. Out of the distributed questionnaires, the researchers received 453 valid responses, resulting in a response rate of 80.8%. This rate is considered sufficient for the objectives of the study.

3.3 Reliability of the Study Tool

To ensure the reliability of the tool, Cronbach's Alpha was calculated. The results are presented in Table 1.

Table 1 Results of internal consistency analysis of the study tool using Cronbach's alpha

Variables	Dimension	Number of items	Cronbach's alpha
Digital transformation	Digital infrastructure	5	0.881
	Digital strategy	5	0.817
	Digital leadership	5	0.785
	Digital culture	5	0.771
	Overall digital transformation	**20**	**0.797**
Employee creativity	Originality	5	0.814
	Fluency	5	0.823
	Flexibility	5	0.889
	Overall employee creativity	**15**	**0.839**

The reliability of the study tool, as indicated by Table 1, is demonstrated by the Cronbach's Alpha values for each dimension of the questionnaire, which ranged from 0.771 to 0.889. It is important to note that a reliability coefficient below 0.60 is considered weak, while a minimum acceptable coefficient is 0.70. On the other hand, a coefficient of 0.80 or higher is considered indicative of good reliability. The values presented in the table affirm the consistency and dependability of the study tool for statistical analysis, highlighting its reliability and the coherence among its items.

4 Testing Study Hypotheses

- **Main Hypothesis**: "There is no statistically significant effect at the significance level ($\alpha \geq 0.05$) of digital transformation with its dimensions (digital infrastructure, digital strategy, digital leadership, digital culture) on employee creativity with its dimensions (originality, fluency, flexibility) at the Department of Statistics in Jordan."

To test the main hypothesis, multiple linear regression analysis was used.

The statistical test results for the hypothesis model are presented in Table 2, which includes independent variables such as digital infrastructure, digital strategy, digital leadership, and digital culture, along with the dependent variable "employee creativity". The findings reveal a significant impact of digital transformation and its dimensions on employee creativity, as indicated by the F value of (142.481), surpassing the table value of (2.13) and reaching significance at the 0.05 level. This underscores the importance of the model. Additionally, the R^2 value of (0.0100) signifies that digital transformation and its dimensions account for the variation in employee creativity within the Department of Statistics in Jordan. Furthermore, the correlation coefficient R = (0.317) demonstrates the influence of digital transformation on employee creativity. The coefficient table for this hypothesis provides the following results:

- Among the dimensions of digital transformation, the dimension (digital strategy) had the greatest impact on the dependent variable (employee creativity), with a Beta coefficient ($\beta = 0.288$). This effect is enhanced by the calculated T value of (5.215), which is greater than the table value of (1.93) and at a significance level (Sig = 0.00).
- The second most significant effect concerns the dimension (digital leadership) with a Beta coefficient ($\beta = 0.286$). This effect is reinforced by the calculated T value of (5.210), which exceeds the tabulated value of (1.93) and at the significance level (Sig = 0.00).
- The third dimension in terms of effect is (digital infrastructure) with a Beta coefficient ($\beta = 0.275$). This effect is enhanced by the calculated T value of (5.182), which is greater than the table value of (1.93) and at a significance level (Sig = 0.00).

Table 2 Multiple regression analysis equation for the effect of digital transformation dimensions on employee creativity

Dependent variable	Model summery		ANOVA				Coefficient				
Employee Creativity	R	R^2	F	F Sig	DF		Dimension	Beta	T	Standard Error	Sig
	0.317	0.0100	142.481	0.00*	Regression	4	Digital Infrastructure	0.275	5.182	0.044	0.000*
					Residual	449	Digital Strategy	0.288	5.215	0.042	0.000*
							Digital Leadership	0.286	5.210	0.051	0.000*
					Total	453	Digital Culture	0.255	5.118	0.043	0.000*
							Overall Digital Transformation	0.797	142.481	–	0.000*

* Statistically significant at the level of ($0.05 \geq \alpha$))
T-table value = (1.93)
F-table value = (2.13)

- The last dimension in terms of effect is (digital culture), with a Beta coefficient ($\beta = 0.255$). This effect is enhanced by the calculated T value of (5.118), which is higher than the table value of (1.93) and at the significance level (Sig = 0.00).

After considering the information provided, we can confidently reject the null hypothesis (HO1) and instead accept the alternative hypothesis, which asserts that there is a statistically significant impact, at a significance level of ($0.05 \geq \alpha$), of digital transformation dimensions (digital infrastructure, digital strategy, digital leadership, digital culture) on employee creativity dimensions (originality, fluency, flexibility) within the Department of Statistics in Jordan.

4.1 Discussion of Results and Recommendations

The findings of the study reveal a noteworthy impact, with statistical significance at a significance level ($0.05 \geq \alpha$), of various dimensions of digital transformation (digital infrastructure, digital strategy, digital leadership, digital culture) on the dimensions of employee creativity (originality, fluency, flexibility) within the Department of Statistics in Jordan. Based on the analysis and interpretation of the study results, the following recommendations can be proposed for the Department of Statistics in Jordan:

- Develop the approach the department uses when using digital technologies such as computers, mobile devices and online services.
- Focus on cultural changes caused by the development and dissemination of digital technologies, especially the Internet and online networks, through new data imposed by the evolving scientific and civilizational world.
- Encourage employees to generate a wide range of alternatives, solutions, ideas or applications when researching a topic, reinforcing the concept of creative fluency.
- Stimulate and motivate employees to adapt to change and find new applications with great flexibility.

Other scholars have the opportunity to make valuable contributions to the field by conducting further investigations into the correlation between digital transformation and various factors that have the potential to enhance employee creativity in diverse industries. For instance, future research endeavors could delve into variables like job dedication and organizational effectiveness, building upon the findings and suggestions presented in this current study.

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The Legal Frameworks' Response to Technological Developments: Protecting Intellectual Property Rights in the Age of Digital Innovation



Omar Al Makhzoumi and Naif Abdullah Al-Amadi

Abstract This research intends to examine how national laws and international treaties influence the safeguarding of intellectual property rights amid swift technological advancements. By assessing existing national and international regulations and determining their efficacy in tackling the emerging challenges posed by technological progress, the research aims to offer a thorough understanding of how well these laws can protect intellectual property rights. A descriptive-analytical methodology was employed to fulfill the study's goals. The findings indicated a pressing necessity to revise national legislation to align with rapid technological changes. Additionally, the research underscored the vital role of international agreements while emphasizing the need for improved coordination and collaboration among nations for successful implementation. In light of these conclusions, the study advocates for updating national laws, enhancing international cooperation regarding intellectual property protection, formulating strategies to defend technological innovations, and promoting awareness and training on intellectual property rights to improve protective measures and confront challenges stemming from technological advancements.

Keywords Intellectual property legislation · Protection of intellectual property rights · Technological changes · Technological innovations · International coordination · Protection strategies · Innovation rights

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1 Introduction

In its most expansive definition, intellectual property encompasses the legal entitlements that emerge from intellectual endeavors within the realms of industry, science, literature, and the arts. As the significance of intellectual property rights continues to grow, the regulation of their provisions and safeguarding has transcended national legislation. National laws that protect intellectual rights are confined to the state's territory, adhering to the principles of territoriality of laws and state sovereignty. Consequently, a number of international treaties have been established to govern intellectual rights on a global scale.

There has been a growing global interest in intellectual property as a whole, particularly regarding its significance in economic development, fostering investment, boosting creativity and innovation processes, facilitating technology transfer to developing nations, and addressing commercial fraud along with the violation of authors' and inventors' rights. These have emerged as sought-after objectives. In pursuit of these aims, an assembly of international governmental organizations has been created to safeguard these rights [1].

Nations globally have implemented legislation to safeguard intellectual property for two primary reasons. The first is to uphold the moral and economic rights of creators, structure how society gains from these innovations, and promote their utilization. The second reason is to guarantee equitable commercial practices and transactions that aid in the economic and social advancement of communities.

Intellectual property is categorized into two primary branches: on one side, there is industrial and commercial property, while on the other, there exists literary and artistic property. According to the World Intellectual Property Organization (WIPO), intellectual property encompasses rights associated with scientific, artistic, and literary works. This includes artistic performances, recordings in both sound and visual formats, broadcasting programs, inventions across various human activities, scientific discoveries, industrial designs, trademarks and service marks, trade names and designations, as well as protections against unfair competition, along with all other rights arising from intellectual endeavors in the industrial, scientific, literary, or artistic domains [2].

Given the swift advancements in technology observed during the digital era, it is essential to evaluate how effectively existing legal structures address these transformations. Consequently, our research will concentrate on examining the responsiveness of legal frameworks to technological progress, particularly regarding the safeguarding of intellectual property rights amidst digital innovation. This study aspires to deliver important insights into the efficacy of both national and international laws in adapting to rapid changes while striving to find a balance between the protection of creators' rights and the encouragement of innovation within the dynamic digital landscape.

1.1 Study Objectives

This study aims to:

- Explain the concept of intellectual property in the context of rights related to intellectual activities in industrial, scientific, literary and artistic fields.
- Analyze international intellectual property regulation at a global level by examining international agreements and institutions that focus on protecting intellectual property rights, such as WIPO and the World Trade Organization (WTO).
- Assess the importance of intellectual property rights in the light of technological progress and innovation, and explore their role in strengthening the global economy, advancing research and innovation, and supporting fair trade.
- Analyze the impact of intellectual property rights on economic and social development and their impact on disparities between countries in terms of progress and innovation.
- Analyze the role of international organizations such as WIPO and UNESCO in regulating and protecting intellectual property rights and the agreements and treaties administered by these organizations.
- Compare intellectual property legislation in different countries and analyze how these laws protect intellectual rights and promote innovation.

1.2 Study Methodology

This study employs a descriptive-analytical methodology, drawing on information from a range of sources such as legal literature, prior research, and both national and international laws pertaining to intellectual property. Additionally, a comparative analysis method is utilized to evaluate the policies and legislations across various countries and their effects on the safeguarding of intellectual property rights. Furthermore, the study will incorporate an examination of pertinent international agreements and national laws by analyzing legal documents and assessing the influence of international organizations in the regulation and protection of intellectual property.

2 The Importance of Intellectual Property Rights in the Era of Technology and Innovation

The matter of intellectual property holds immense importance, as it relates to a delicate and vital issue. This topic's significance is amplified by the substantial advancements in information technology and innovations, which have resulted in the creation of new and sophisticated methods for sharing knowledge in both simple and effective manners.

The increasing significance attributed to intellectual property by nations arises from its contribution to enhancing global economic activity. This importance is further acknowledged by various scholars, including economists, political scientists, sociologists, educators, and legal experts, who have dedicated attention to the topic. Particularly in industrialized nations, there has been a concentrated effort on intellectual property rights, evident in both scientific inquiry and practical applications, leading to the production of research and literature on the matter, as well as its integration into academic curricula at universities and institutes.

Consequently, prioritizing intellectual property rights has emerged as a pressing national imperative, particularly within the framework of a technologically governed and machinery-driven commercial and industrial age. The evident gap in the ownership of intellectual property rights among nations has resulted in a global division characterized by differing levels of advancement and development. Some nations are classified as advanced, others as developing, and some as underdeveloped. Indeed, a nation's power is increasingly measured by the quantity of intellectual property rights it holds. This uneven distribution of rights among countries leads to notable variations in production capacities, quality standards, national income, and individual living conditions. Furthermore, as nations accumulate more of these rights, their influence expands.

The growing significance of intellectual property rights has prompted nations worldwide to implement regulations governing these rights, establishing it as a contemporary legal field. Given that creating any product or work demands considerable time and financial resources, innovators seek to recoup their investments by securing "intellectual property rights." Such rights empower the innovator to enforce limitations on the utilization of their intellectual property. For instance, no individual is permitted to use, manufacture, cultivate, sell, or showcase the innovation without first acquiring consent from the innovator. A variety of protective measures are available, such as copyrights, trade secrets, trademarks, plant breeder's rights, patents, and more [2, 3].

Countries provide intellectual property rights as a means to reward creative endeavors and the human efforts that contribute to societal advancement. For example, research suggests that without the safeguards offered by patents, approximately two-thirds of contemporary medical innovations would not have been realized, as these protections enable funding for research through generated revenue [4]. The emergence of various media industries, including recording and distribution sectors, as well as software development that brings in billions of dollars, would not have been possible without copyright protection. Likewise, the assurance of strong international trademark protections and the enforcement of laws against counterfeiting and piracy are essential for consumer confidence in purchasing products and services [4].

The evolution of intellectual property has been significantly shaped by historical milestones, starting with the Vienna Conference in 1873 and culminating in the formation of the WIPO in 1974, which functions as a specialized agency of the United Nations. The primary motivation behind the international development of intellectual property frameworks has consistently been the aim to foster creativity

and safeguard intellectual endeavors [5]. However, it was not long before member states engaged in GATT negotiations found themselves taken aback by a proposal from major multinational corporations that was submitted to the GATT Secretariat in Geneva in June 1988, advocating for the incorporation of an agreement on "Trade-Related Aspects of Intellectual Property Rights (TRIPS)" into the GATT agreements.

Significantly, these companies, although not participants in the negotiations due to state membership restrictions, pushed their proposal forward. Their aim was to obtain enhanced safeguards for intellectual property, especially concerning patents and trademarks. Ultimately, the GATT agreements were released, which included the TRIPS Agreement. Signed in April 1994, these agreements led to the establishment of WTO, which commenced its role on January 1, 1995, overseeing the implementation of what are now referred to as the Global Trade Agreements [6].

3 The World Intellectual Property Organization (WIPO) and Intellectual Property Protection

This section addresses two main topics: the legal nature of the World Intellectual Property Organization (WIPO) and the agreements and treaties managed by WIPO.

3.1 The Legal Nature of the World Intellectual Property Organization

The World Intellectual Property Organization is regarded as a specialized intergovernmental organization on an international scale. In the realm of international law, it is widely recognized that states and international organizations are the main subjects of law. Based on membership and origin, international jurisprudence categorizes organizations into intergovernmental entities when they represent the governments of states. Consequently, examining the World Intellectual Property Organization, which focuses on the safeguarding of intellectual property, necessitates an inquiry into its legal nature.

WIPO came into existence through the voluntary agreement of certain states, formalized on July 14, 1967. The preamble of this international agreement explicitly references this fact, along with the organization's international character in relation to its director and staff, as outlined in Article 9, Paragraph 8. This foundation enables us to conclude that WIPO functions as an intergovernmental international organization tasked specifically with the protection of intellectual property. Consequently, it is recognized as a subject of public international law, regulated by its own set of rules, principles, and systems. In this role, WIPO is empowered to engage in international agreements pertinent to its competencies with any relevant entities in international

law, including states, intergovernmental organizations, and non-governmental organizations. Furthermore, WIPO is entitled to ensure that its employees, who operate under its management and oversight, receive the same rights and privileges as those afforded to other international personnel. Additionally, it possesses the capability to establish a headquarters agreement with the host state.

3.2 The Competencies of the World Intellectual Property Organization

The objectives that motivated the establishment of the World Intellectual Property Organization (WIPO) are in harmony with its competencies. The preamble of the WIPO Convention, which was signed in Stockholm on July 14, 1967, clearly indicates that the organization was created by the contracting parties to foster understanding and cooperation among states for their shared benefit, grounded in the principles of sovereignty and equality. Furthermore, the organization aimed to strengthen the global protection of intellectual property to stimulate innovative endeavors and enhance the effectiveness of the unions formed for safeguarding industrial property, as well as literary and artistic creations, all while fully honoring the autonomy of each union [7].

Accordingly, Article 3 of the founding convention states that the purposes of WIPO are [8]:

1. Promoting the protection of intellectual property worldwide through cooperation among countries and with any other international organization where appropriate. This general objective is described in detail in certain elements of Article 4 of the same Convention, which relates to the functions of its organs and the founding agreement.
2. Ensuring administrative cooperation between unions. The term "links" here refers to the specific meaning provided for in Art. 2 section 7 of the Convention, which covers the Union of Paris and the special unions established, as well as the special agreements concluded regarding that union, the Union of Bern, and any other international agreements intended to promote the protection of intellectual property. WIPO is responsible for implementation in accordance with Art. 4 of the founding convention.

It is essential to highlight that the original aim of the WIPO Convention's drafters was to broaden its range of competencies by permitting any measures considered suitable for safeguarding intellectual property. The content of Item 8 in Article 4 of the founding convention [9] supports this assertion.

3.3 Agreements and Treaties Administered by the World Intellectual Property Organization

As stated in Article 3 of the convention, the organization seeks to promote the safeguarding of intellectual property on a global scale by fostering collaboration between nations and other relevant international entities when suitable. Additionally, it aims to facilitate administrative cooperation among the unions.

One of the key sources of international law is international agreements, which play a vital role in regulating and governing the interactions among the subjects of international law, encompassing economic, cultural, security, and military relations. Consequently, these agreements are instrumental in shaping international legal norms [10].

The organization was granted extensive international legal authority by the WIPO Convention, as outlined in Articles 3 and 4. It was thus empowered to undertake any suitable actions aimed at safeguarding intellectual property (Item 8 of Article 4) and to promote the establishment of international treaties and agreements designed to enhance the protection of intellectual property (Item 4 of Article 4). In this regard, the organization is also able to assume the responsibility for carrying out administrative duties that arise from the enforcement of any international agreement focused on bolstering intellectual property protection (Item 3 of Article 4) [11].

3.4 Key Agreements Administered by the Organization

We will attempt to list the key agreements and treaties administered by the World Intellectual Property Organization [12]:

- The Paris Convention for the Protection of Industrial Property, March 20, 1883.
- The Madrid Agreement for the Repression of False or Deceptive Indications of Source on Goods, April 14, 1891.
- The Rome Convention for the Protection of Performers, Producers of Phonograms, and Broadcasting Organizations, October 26, 1961.
- The Patent Cooperation Treaty, signed in Washington on June 19, 1970, amended on September 28, 1979, February 3, 1984, and October 3, 2001.
- The Geneva Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of Their Phonograms, October 29, 2001.
- The Brussels Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, May 21, 1974.
- The Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, April 28, 1977, amended on December 26, 1980.
- The Nairobi Treaty on the Protection of the Olympic Symbol, September 26, 1981.

- The Berne Convention for the Protection of Literary and Artistic Works, September 9, 1886.
- The Washington Treaty on Intellectual Property in Respect of Integrated Circuits, May 26, 1989.
- The Trademark Law Treaty and its implementing regulations, October 27, 1994.
- The WIPO Copyright Treaty, December 20, 1996.
- The WIPO Performances and Phonograms Treaty, December 20, 1996.

4 The United Nations Educational, Scientific and Cultural Organization (UNESCO) and Intellectual Property Protection

The United Nations Educational, Scientific and Cultural Organization, commonly referred to as UNESCO, serves as a specialized agency within the United Nations. Founded in 1946, its headquarters are located in Paris. Member states have committed to fostering peace and security by collaborating in the fields of education, science, and culture.

Consisting of approximately 160 nations, the organization includes nearly all United Nations member states, which contribute the bulk of its funding. UNESCO aims to promote enhanced justice, cooperation, human rights, and fundamental freedoms for every individual. Additionally, the organization carries out initiatives to advance these objectives upon the request of any member; however, the majority of its resolutions can only be enacted if the governments of the member states undertake specific actions within their respective countries [1, 5].

The organization aims to disseminate its concepts globally, highlighting the importance of enhancing educational standards and fostering cultural exchanges. It advocates for the peaceful application of scientific knowledge and motivates artists, scientists, students, and educators to travel, study, and work abroad. Its focus is on leveraging social sciences to address challenges such as racial discrimination and violence. Additionally, it promotes scientific inquiry in fields like energy consumption and environmental conservation, collaborating with United Nations agencies and other organizations to support developing nations. The organization works in consultation with approximately 500 non-governmental organizations that assist in the planning and execution of relevant programs [10].

4.1 Organization Activities Through Conventions, Recommendations, and Declarations

Like all organizations, UNESCO is active and manages a range of conventions, recommendations, and declarations in its areas of expertise. The most important ones are [5, 13]:

In the Field of Conventions

- The International Convention against Doping in Sport [1, 14].
- The Convention on the Protection and Promotion of the Diversity of Cultural Expressions.
- The Convention for the Safeguarding of the Intangible Cultural Heritage.
- The Convention on the Protection of the Underwater Cultural Heritage.
- The Convention on the Protection of Technical and Vocational Education.

In the Field of Recommendations

- The Recommendation concerning the Promotion and Use of Multilingualism and Universal Access to Cyberspace [5, 15].
- The Recommendation on Adult Education in the twenty first century.
- The Recommendation on the Safeguarding of Folklore.
- The Recommendation on the International Standardization of Statistics relating to the Production and Distribution of Books, Newspapers, and Periodicals.

Through Declarations

- The Universal Declaration on Bioethics and Human Rights [1, 16].
- The UNESCO Declaration concerning the Intentional Destruction of Cultural Heritage.
- The International Declaration on Human Genetic Data.
- The Charter on the Preservation of Digital Heritage as a Common Heritage.
- The UNESCO Universal Declaration on Cultural Diversity.

4.2 UNESCO's Efforts in Intellectual Property Protection

UNESCO stands out as a crucial entity that has made groundbreaking contributions to the safeguarding of intellectual property broadly, and copyright specifically, on a global scale. This is accomplished through its own initiatives or in partnership with the World Intellectual Property Organization (WIPO) and other international bodies engaged in this sector [17]. The organization is responsible for managing and enforcing worldwide copyright treaties. Notably, UNESCO oversaw the International Convention for the Protection of Performers, Producers of Phonograms, and Broadcasting Organizations, which was finalized in Rome in 1961, along with the 1971 Geneva Convention, referred to as the Phonogram Convention, designed to protect producers of sound recordings from unauthorized reproduction of their works [15, 18].

Among UNESCO's key contributions to copyright protection are [5, 19]:

- **Encouraging respect for copyright**: Promoting the principle of respect and protection of copyright as a fundamental aspect of cultural and educational development.
- **Facilitating the transfer of rights**: Insisting that publishers and copyright holders in developed countries facilitate the transfer of their translation and reproduction rights to publishers in developing countries on favorable terms to encourage those countries to engage in international agreements.
- **Establishing an International Fund for the Promotion of Culture**: Supporting developing countries in benefiting from global knowledge and strengthening their national culture, while ensuring international copyright protection.

UNESCO has made a substantial impact on both the Arab and global platforms, marked by significant accomplishments such as devising educational strategies tailored for the Arab region, formulating an extensive plan for Arab culture, and compiling the Palestinian Encyclopedia in both its general and detailed formats. Moreover, UNESCO has partnered with Arab entities, including the Arab Society for Intellectual Property, as well as numerous international organizations to facilitate the exchange of knowledge and expertise, especially in the realms of intellectual property protection and copyright.

The organization collaborates with various institutions, such as the Arab Center for Research and Translation, the Damascus Center, the Arab Research and Studies Institute in Cairo, the Institute of Arabic Manuscripts in Cairo, and the Coordination of Translation Books in Morocco. Additionally, it backs national initiatives and has released a multitude of intellectual works, which include significant references along with several annual and semi-annual journals [15, 20].

5 Conclusion

This research emphasizes that the evolution of digital technology has introduced fresh challenges to existing intellectual property laws. While there has been significant progress in both national and international legislation to tackle certain issues, evident gaps remain in adjusting to the swift advancements in digital development and the various forms of infringement. It is crucial for legal frameworks to embrace more adaptable strategies and stay aligned with technological innovations to guarantee the effective safeguarding of intellectual property rights within the changing digital environment.

5.1 Findings

The study concluded the following results:

- In numerous nations, the laws governing intellectual property require revision to adapt to swift technological advancements and the challenges presented by the global marketplace.
- International treaties are crucial for strengthening the protection of intellectual property rights, yet they necessitate improved collaboration among nations to guarantee successful enforcement.
- The advancement of technology has made it more challenging to safeguard intellectual property rights, requiring the development of new approaches to tackle emerging concerns.
- A deficiency in knowledge and education about intellectual property rights hinders their enforcement and safeguarding.

5.2 Recommendations

This study recommends the following:

- Updating national intellectual property laws to adapt to technological advances and market challenges, ensuring compliance with international standards.
- Strengthening international cooperation to activate and effectively implement international intellectual property agreements.
- Developing new strategies to address intellectual property rights issues arising from technological innovation.
- Raising awareness and training on intellectual property rights for individuals and businesses to prevent infringements and improve protection.

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The Influence of Hate Speech and Technology on Society



Aref A. Murshed and Alalddin Al-Tarawneh

Abstract Hate speech is a type of speech that exists in society and is toxic or derogatory to a specific group or groups that suffer from some type of prejudice. This speech is often characterized by offensive remarks, malicious innuendos, hateful insults and expressions of contempt. Several scholars and activists have recognized that hate speech can negatively impact community dynamics, institutional interactions, and personal relationships. This research focuses on the role of technology in hate speech and the ways in which digital platforms can cause and exacerbate hate speech. In other words, this article examines the different types of digital hate speech and its consequences for society, as well as how technology contributes to its spread and facilitates its influence. This study used a descriptive analysis approach, including a systematic literature review of scientific articles, legal regulations, and expert opinions on technology and hate speech. Overwhelmingly, the findings indicate that we need a comprehensive, digitally-enabled strategy to mitigate the impact of hate speech and reduce its occurrence in society. The article states that responses to the threat of digital hate speech should include elements of legal responses, technological solutions and educational programs that will counteract the causes and effects of digital hate.

Keywords Hate speech · Hate crimes · Social cohesion · Community engagement · Education · Legal measures · Counteraction strategies · Prevention strategies

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1 Introduction

In this age of unparalleled connectivity and worldwide conversation, the all-encompassing power of hate speech has spread a gloomy cloud over the intricate pattern of society [3, 4, 10, 15]. This subject delves into the deep and complex influence that hate speech exerts on the shared awareness, social dynamics, and fundamental basis of peaceful cohabitation. Hate speech, with its poisonous language and prejudiced statements, goes beyond simple words; it seeps into the very fabric of society, leaving lasting imprints that echo through communities, institutions, and personal connections. In order to fully grasp the extent of its impact, let us embark on a journey to understand what hate speech truly means. We will carefully follow the lines that divide it from freedom of expression [3, 5, 23, 25, 26]. We will continue to tread on the rocky terrain of epistemology, recognizing the reverberations far beyond individual layer, we see that coming to terms with and mitigating the effects of hate speech is not just an intellectual task but also a moral imperative for the building of healthy and robust societies.

Hate speech is an issue that is fiercely debated in public discourse. It bears significant consequences to the civic unity and the values of free speech within the society. One takes an approach to defining it while the other is reluctant to confine it. This complexity comes from its subjective nature and the tension that features between the freedom of speech and the potential harm on others. The essay will explore the concept of hate speech, comprehend its conflicted definitions, key characteristics and try to define it with accuracy while clarifying the challenges [2, 3, 28, 29].

Hate speech is a form of expression that aims to offend others, create a climate of fear or threaten, marginalize or insult constitutions groups through speech, writing, text or behavior within a designated society against the rights of targeted groups encompassing race, ethnicity, religion, sex, sexual orientation, gender, disability and other dimensions used to discriminate against groups of people [6]. This definition means that any category of spoken words speeches, written text messages, symbols, gestures appears under any form and channel within any cultural interaction styles.

In order to reach a good understanding of the concept of hate speech, it's crucial to explore its particular features. Hate speech often consists of dehumanizing stories, negative stereotypes and derogatory words, which can therefore encourage prejudice and intolerance and conclusively lead to stigmatization and marginalization of minority groups [3]. On one hand, hate speech may be overt, and many criminalizations have codified ways to use profanities and verbal insults. On the other hand, hate speech may also be disguised, concealing its discriminatory aims through indirect language. The intentionality behind such speech can also vary greatly, and this aspect is central to the definition of hate speech: it is not offence at large, but a kind of speech whose purpose is to cause severe pain, instil fear, provoke violence or lead to the isolation of a minority group. Hate speech is an elusive concept; it is both cultural and social, and the problem of language and the difficulty of drawing the line is not new. These difficulties arise principally for the reason that hurtfulness is

a subjective concept protected by freedom of speech. Moreover, linguistic conventions often change and novel forms of expression (e.g., posts on social media sites or instant messaging) create constantly new challenges. Nevertheless, we have reached a point where the search for safe spaces, through the criminalization and denunciation of hate speech, which is perceived as intolerable uses of speech, seemed to bring conflicting demands in the balance between free speech and harm prevention to a head. As highlighted recently, lawmakers, institutions and society at large are struggling to strike the right balance in deciding when to accept offensive speech in the name of tolerance, and when to advance legal and moral notions of dignity.

Because hate speech raises troubling questions about individual interests and group conflicts, it is worth definition and inquiry. Why? Because, as a society, we cannot identify the harmful consequences of hate speech without knowing its definition and qualities. As we navigate creating a definition for hate speech and its subsequent effect on people and communities, we must both create room for dialogue about these concepts, and—at the same time—work against speech that discriminates and harms.

1.1 Importance of the Study

Exploring the idea of hate speech is incredibly important in today's society because it has a big impact on people's lives and how we all get along. If we want to come up with good ways to fight against hate speech, we have to really understand what it is and how it works. Hate speech is everywhere nowadays, and it's been connected to more discrimination, prejudice, and violence against groups of people who are already treated unfairly. By looking into this topic, we can learn a lot about how hate speech happens and figure out why it happens too. In addition to that, when we embark on this investigation, it enables us to evaluate how hate speech affects the freedom to express oneself. This is because the line between speech that is protected and expression that causes harm is frequently unclear. By diving into the significance of examining hate speech, we equip ourselves with the understanding necessary to create well-informed policies, educational programs, and interventions in society. These efforts aim to encourage inclusivity, tolerance, and safeguarding of basic human rights. As we untangle the intricate nature of hate speech, we empower individuals and communities to cultivate a social environment that is stronger and more harmonious.

1.2 Methodology

In this paper, we adopt a descriptive-analytical approach to present a thorough account of hate speech and its subcomponents. That is, we will outline its origins and definitions, it is manifestations and consequences. The descriptive aspect of

this paper would involve conducting a systematic literature review of hate-speech-related literature, scholarly articles, legal frameworks, and expert opinions. This would entail utilizing findings from existing research published in peer-reviewed journals, academic research, and professional entities (such as think-tanks) to provide a frame of reference for better comprehending hate speech and its multifaceted nature. Furthermore, the analytical component would involve examining patterns and themes within the identified literature by drawing upon important and recurring elements to uncover how hate speech works. This includes understanding the various forms it takes both online and offline, its perpetrators and victims, and the consequences of hate speech across society, including on those who are victimized by it [9]. A qualitative research approach would also be utilized in this endeavor by presenting real-life examples and case studies to provide an illustration of how these negative consequences might manifest in practice (that is, descriptively). This approach would prove useful in placing theoretical frameworks in a real-world context and further understand them (descriptive). Next, a link between these illustrative examples and hate speech's consequences allows for recognizing how the manifestation of hatred, public intimidation, intentional offence, and racism lead to systemic bias and our detrimental consequences on society in a more tangible manner.

2 Literature Review

Hate speech has become a social problem of our time when it fuels unbridled behavior such as discrimination, violence and social division. The purpose of this literature review is to provide insight into the damaging effects of hate speech on individuals and communities. Primarily achieved through current research and authoritative sources.

Numerous studies detail the profound psychological impact of hate speech on its targets. For example, in 2021, Wang and Fritsche used data from Twitter to find that hate speech increases stress and anxiety and lowers the self-esteem of people (who the two call "victims" of hate speech). Harper and colleagues found longer-lasting mental health effects in a 2019 study. These observations underscore the importance of studying hate speech as a public health issue.

Like racially motivated anger, hate speech harms not just individuals but the entire fabric of society. When people feel like targets, the glue that holds society together breaks down [4].

Other legal scholars have done extensive groundwork in this dense area, seeking to explore the role of hate speech with academic rigor. In her framing work, Citron [20] delves into different legal frameworks regulating hate speech and balancing free speech with marginalized groups.

Notably, recent research on how to counteract the negative effects of hate speech through educational interventions presents several studies that combat and reduce hate speech through education. In their article, "Education as a Driver of Tolerance and a Facilitator of Inclusion: The Case for Focused Education Initiatives to

Combat Hate Speech," Garcia and colleagues state that "Targeted education initiatives can significantly reduce the incidence of hate speech. Frequency and Frequency. "Impact."

This literature review demonstrates that hate speech can have far-reaching consequences in psychological, social, legal and educational domains. As the cited studies demonstrate, it is becoming increasingly urgent to implement interventions to improve society and counteract the far-reaching effects of hate speech. These interventions will promote a more tolerant and accepting culture.

3 Hate Speech and Society

3.1 Forms and Manifestations of Hate Speech

Hate speech is a scourge on society as it occurs in many aspects of society in various ways; both online and offline. Hate speech is a provocation and can be seen as a threat to peace, but it also has a linguistic component. This article sheds light on the world of hate speech as it manifests online in social media and forums, in the realm of public speaking, and offline in the vice of hate. When we understand the ways in which people engage in hate speech, we can target consequences and move toward a harmonious society that works for everyone.

Social media provides space for interaction between people. A space for free expression and, to some extent, a space where individuals can freely express who they truly are. However, social media also has significant disadvantages. While its purpose is to build a sense of community and provide a space for free communication, it also promotes hate speech and other forms of offensive speech. It is hate speech and stereotypes like these that attract bad actors and, if left unregulated, can destroy individuals and the platform itself. This has been demonstrated in the work of Smith and Jones [18]. Hate speech is amplified and spread on social media in ways that are now difficult to control and perhaps even impossible to stop. It's easy to build a sense of community in a space that's free but open to almost everyone. Therefore, a simple sense of neighborliness can be dwarfed by the space occupied by malicious individuals and the like.

User-generated content and subsequent discussion in online spaces may also create a further environment for hate speech. In their recent study, Brown and colleagues [7] explain how these spaces ultimately serve as echo chambers, where amplification cycles of peers lead to the amplification of hate speech. The safe spaces provided by digital communications allow people to express radical ideas unchallenged and without recrimination, creating an atmosphere that prepares individuals for the unbridled flow of hate speech.

While public speaking can be a space for people to express their feelings freely, it is sometimes used to spread hateful messages through public speaking. I think people who are responsible for public speaking, like politicians, cause a lot of controversy

because they use provocative language to target certain minority groups with hate speech. Johnson and White's [17] study explores how the impact of hate speech conveyed through public speech can further divide society.

Hate crimes are a reality based on hate speech and a manifestation of hate speech coming from internet echo chambers. A study by Garcia and Davis [14] sought to elucidate the causal relationship between hate speech and hate crimes and show how these speeches can be rhetorically amplified and lead to violence against vulnerable groups.

Understanding the different forms of hate speech is important to developing effective strategies to combat it. Hate speech can originate in virtual spaces, social media or forums, or it can be translated into reality through speech in public spaces or hate-motivated violence. Hate speech can have varying consequences for society, ranging from alienation to ostracism of affected individuals and communities. Nonetheless, one can always try to convey a self-image of a diverse and respectful society: combating the root causes of hate speech and targeted interventions, such as campaigns against prejudice, are key to building a diverse, vibrant society [5]. A first step for society to therefore reduce the negative impact of hate speech.

3.2 Targets of Hate Speech: Unmasking Discrimination Across Racial, Religious, and Vulnerable Groups

Judging from recent conversations and reports, we can't help but think this is a force akin to a malignant disease. However, people with this ability sometimes become infected almost habitually, or simply because they suffer from this plague, without even realizing that they are actively encouraging it. Some localized forms existed even in ancient human communities, but had it not been for widespread and growing prejudicial behavior, discrimination, and exclusion, hate speech might not have become the subject of fierce resistance between defenders and passionate victims. It simply targets certain groups in society based on place of birth. In my article, I will place special emphasis on those groups that are the first victims of hate speech and its consequences, such as racial and ethnic communities, religious minorities, and other groups. By becoming familiar with the specific types of hate speech-related dilemmas that arise in the lives of these groups, we will be better able to confront the causal power of the spread of hate speech with the goal of building a better society. Hate speech is poison.

Hate speech targeting racial and ethnic communities remains a persistent and damaging problem in our society. Many studies have consistently shown that minority groups are vulnerable to hate speech, ultimately leading to increased levels of stress, anxiety, and prejudice [18]. The use of derogatory terms, racial slurs and insults reinforces the marginalization of these groups and promotes stereotypes that justify the use of such language. In extreme cases, aggression against these groups is

valued, normalized, and even activated, thereby increasing the desire to engage in discriminatory actions.

Religious groups are not immune to hate speech that can lead to discrimination based on their identity. In a recent study, I found that people who experience their religious identity online are more likely to experience hate speech. Unfortunately, religious minorities are disproportionately affected; this affects how we see ourselves and how others see us. Religious identity and hate speech go hand in hand: affecting group relations and endangering religious freedom and pluralism. Additionally, hate speech directed at religious groups reinforces a culture of dehumanization and causes further suffering for community members [1].

In addition to racial, ethnic and religious minorities, hate speech often targets members of the LGBTQ + community, people with disabilities, immigrants and others. An important empirical study by Garcia and colleagues [13] shows the harm caused by hate speech to these groups and the importance of addressing this harm through intersectional approaches, as these groups may be affected differently.

In this particular context, hate speech forces target racial and ethnic groups, religious groups, LGBTQ people, and other traditionally vulnerable groups, engaging in a never-ending cycle of discrimination. Such statements are inconsistent with the goals of equality and justice, which recognize the special or additional burdens faced by these communities. Only by recognizing the unique struggles of each audience and the root causes of hate speech can we resist it through education, advocacy, and legal means and seek to create a society that values diversity and proactively combats discrimination to eliminate corrosive behaviors targeting those in our communities. Hate speech from the most vulnerable members.

3.3 Social Cohesion and Community Relations: Unraveling the Impact of Hate Speech

Hate speech is a destructive force that stems from selective attention to others and is a psychosocial force that undermines the social fabric of human relationships. This article focuses on the impact of hate speech on social cohesion and relationships between people, highlighting the impact of hate speech on communities by explaining the growing loss of trust between parties to a conflict and the polarization of those who impose enforced isolation. The atomization of society stands in stark contrast to the great enemy of modern totality. This is essentially network-like, exposing its complex structure and helping us understand the long-term impact and consequences of hate speech on the bonds that hold communities together.

Speaking ill of a person or group reduces trust among citizens. Once those targeted against them experience discriminatory remarks, those affected begin to harbor distrust and suspicion of the concerns and priorities of those they perceive to be behind the abuse; in turn, trust structures often begin to break down. In our recent research on hate speech in psychology 2022, Miller and Johnson found that hate speech reduces

members' commitment to shared values and mutual understanding—which are at the core of how people trust each other.

Of course, hate speech is a cancer on society. The articulation and discourse of hate speech is inherently divisive because its language divides people along ideological, cultural, or identity-based lines. According to a study by Roberts and White [22], hate speech has been shown to contribute to the formation of echo chambers, in which like-minded people only repeatedly reinforce each other's views, thereby deepening large differences between different viewpoints. Humanity's Ring Lock Divide.

But perhaps its most damaging effect is the damage it does to the social fabric itself—creating divisions not just within groups but between communities, consciously isolating themselves from wider forms of participation and rationality. Chang et al. [8] systematically analyze this ripple effect and illustrate how today's hate speech undermines social fabric and hinders coordinated efforts to achieve collective goals.

The clear message is that it is often social cohesion and community relations that pay the price of hate speech, because of its cumulative impact on trust, the breakdown of relationships and the way people learn from each other. Hate speech can permanently damage the fabric of human community. This must be recognized if we are to move towards socially inclusive communities and help build more resilient communities. Addressing hate speech requires a multi-faceted approach that takes into account education, law and community. This is necessary to rebuild trust, bridge divisions and balance tense voices in the community.

4 Role of Media in Perpetuating or Combating Hate Speech

Since media is an important form of information exchange, human conscience will always be inclined to be changed by the information conveyed to individuals through media. This article aims to explore the different roles that the media plays in supporting or curbing hate speech. By analyzing the ways in which the media represents people, identifying the importance of journalistic ethics, and the ways in which various forms of media perspectives are addressed, readers will hopefully understand the critical role that the media plays in creating tensions. Social or foster inclusivity and open storylines.

Media depictions can greatly influence public opinion and fill people's minds with inaccurate or salacious stereotypes. These images perpetuate beliefs about this stereotype and reinforce biased comments. Empirical research by Lee and Chen [19] shows how much influence the media has on whether the public is satisfied with groups that suffer from prejudice. The media must provide balanced and factual reporting to avoid the normalization of discriminatory ideas.

It is also important to note that the media always has a vital role to play by adhering to responsible journalistic standards such as: B. Ethical reporting, fact-checking, and fair and objective reporting. Research by Smith and Williams [24] shows that when media organizations stop spreading hate speech, hate speech ceases to be a problem.

Media promotion of initiatives aimed at combating hate speech is an important factor in creating a different, more inclusive and accessible narrative to shape the conversation. Educational programs, public service announcements, and tolerance and awareness campaigns can change the narrative. Garcia and Martinez's [12] study of the success of media-based initiatives to combat hate speech highlights the extent to which strategic communication initiatives can bring about positive change.

Society's views or attitudes toward the media often influence the content created and produced by the media. The media plays an important role in spreading or condemning hate speech. If the media portrays things a certain way, the public will view them the same way. It is therefore vital that journalists and media organizations report responsibly so as not to take the hate movement to another level. Strategic communications efforts to combat hate speech can actually help create an "open society." Given the rapid evolution of the media environment, it is important to recognize that media organizations have an outsized influence on public discourse and that we can all work together to ensure that narratives emerging from responsible reporting promote tolerance and refuse to rely on it to Use the language of hate.

5 Case Studies

The scars of hate crimes run throughout history—they are committed "because" of a person or group's race, religion, ethnicity, sexual orientation, or other protected identity. Different hate crime case studies can be used to examine different elements of hate crimes. For example, you could investigate hate crimes that occurred in the past. You can also view recent or current hate crimes. They could even compile a collection of global hate crimes.

Hate crimes come in all shapes and sizes. Throughout history, governments have sanctioned hate crimes and committed massive human rights abuses. People suffered and lost their families, homes and many other things. Hate crimes were at their worst during World War II. The Nazi regime implemented a systematic policy of oppression and extermination against European Jews. Six million Jews were tortured and killed because of Nazi ideology. Hate crime ideology led to one of the deadliest mass murders in human history United States Holocaust Memorial Museum [27].

Hate crimes remain prevalent today. The 2015 church shooting in Charleston, South Carolina, is a poignant example of the reality of hate crimes in America and their consequences. On a warm night in June, angry racist Dylann Roof visited a historic black church with 300 members. As the victims stood up to pray, Roof shot and killed nine men on duty. This shooting brought racial hatred to the surface of a hate crime, for the world to see, and as a potential solution to its root causes [11].

We only get a glimpse of what happens within national borders, but hate crimes appear to spread like a virus across borders, making it a global problem. For example, during the 2002 riots in the Indian state of Gujarat, there were many killings, assaults, sexual assaults, and mass deportations against Muslims. In this case, religious tensions were one of the factors that prompted the hate crime. Documenting

hate crimes around the world highlights the importance of global cooperation to prevent hate crimes Human Rights Watch [16].

Case studies of hate crimes, from the distant past to the present, and across the world, highlight the continued occurrence and recurrence of hate crimes. These examples also illustrate the diversity of motivations behind hate crimes, namely racism, religious hostility and xenophobia, [2]. This highly complex challenge requires learning from past experiences and creating a world free of future abuses. History can help us understand the complexity of hate crime, make it visible now, combat its current manifestations, and encourage countries to work together to prevent future crimes. Only when societies understand the underlying complexity of what haters represent can they eliminate their roots and build a world of values that values diversity, acceptance, and the fundamental worth of every human being.

6 Counteraction and Prevention Strategies of Hate Crimes

Hate crimes affect all types of communities and have widespread and damaging effects. Therefore, it is important to proactively address hate crimes and work to prevent them from occurring. In this article, I will outline some strategies for reducing hate crimes by focusing on different aspects of their occurrence. These include programs to promote education and awareness activities focused on community-level interventions, as well as legislative measures, including greater involvement of law enforcement. As these approaches examine the public policy and collective capacity of society as a whole to help diminish the occurrence of hate crimes, you can speculate that this is a multipronged approach to help prevent hate crime behavior.

Another tool in the fight against hate crimes is education. Education and awareness programs are important resources that can help address entrenched stereotypes and teach critical thinking to eliminate bias. There are countless education and awareness programs, but the Southern Poverty Law Center's Teaching Tolerance Initiative is a particularly outstanding one. The Southern Poverty Law Center works to transform one classroom at a time by providing teachers with the tools to promote tolerance and reduce bias and intolerance Southern Poverty Law Center [26].

Reaching out to our communities is perhaps the most powerful weapon in the fight against hate crimes, because getting to know others builds social bonds and a sense of belonging. Community efforts to build coalitions that span diverse demographic groups help build a stronger, more inclusive community. The Not In Our Town (NIOT) campaign is a great example of how communities can take action against hate crime by connecting people through conversation, action and local action. Encourage community members to take a role in civic leadership, raise their voices, and demonstrate the power of their determination not to tolerate hate Not In Our Town [21].

To effectively combat hate crime, the law must be applied and enforcement action taken. These two components are necessary for a comprehensive strategy to combat hate crime. When you pass and enforce laws that directly target hate crimes, you send a loud and clear message: Hate crimes will not be tolerated and will not be

allowed. An example of such legislation is the Matthew Shepard and James Byrd, Jr. Hate Crimes Prevention Act of 2009, which expanded the number of federal prosecutors Jurisdiction to prosecute hate crimes based on sexual orientation, gender and disability. Laws that Effectively Combat Hate Crimes [28].

Responses to hate crime must take a multifaceted, coordinated approach that targets multiple aspects, including the psychological factors associated with such crimes, the ability to demonstrate understanding and empathy, and the imposition of sanctions against those responsible. In order to spread a culture of tolerance, education of the common people is crucial. Meaningful community engagement helps us overcome social challenges. At the same time, the enforcement of legal sanctions by law enforcement agencies is also a strong signal that they are taking the most stringent measures to combat hate crimes. By integrating and integrating the above strategies, we must work to eliminate the drivers of hate crimes in our societies and build a global society characterized by a spirit of diversity, justice and equity.

7 Conclusion

In short, the interpersonal and ongoing nature of hate crimes requires a comprehensive and multifaceted approach to effectively address and prevent them. Programs like Teaching Tolerance educate and raise public awareness and are vital to combating prejudice and promoting understanding. As the Not in Our Town movement has proven, community engagement can foster strong social bonds that mobilize against hate. Legislative initiatives such as the Matthew Shepard and James Byrd Jr. Hate Crimes Prevention Act demonstrate that hate crimes can have severe legal consequences. Comprehensive efforts such as these offer real opportunities to combat hate crimes, their causes and consequences, and represent an appropriate and meaningful response to the "crime of the century." Taking unknown, rigid actions in the face of change and accepting biases reinforced by morality and habit. Yet socially conscious teaching, community involvement, and legal action can underpin a life dedicated to inclusivity, cultural acceptance, and the greatest personal and political commitment to standing up to hate. Going forward, our commitment to learning, teaching, and fighting for the laws needed to promote this change will be our greatest allies in building a world that embraces diversity and rejects any attacks on its citizens because it strongly rejects race, ethnicity, gender, religion, ability and sexual orientation.

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Politeness in Courtroom Language from a Linguistic Perspective



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Abstract Politeness, as defined by The Oxford English Dictionary, encompasses courtesy, good manners, and respectful behavior towards others. In the realm of language, politeness can be understood as efforts to uphold each other's dignity during interactions (Brown and Levinson in Politeness: Some Universals in Language Usage. Cambridge University Press, Cambridge, 1987 [9]). However, courtroom proceedings differ significantly from everyday conversations due to the institutional nature of the setting. Therefore, politeness within the courtroom necessitates a solemn atmosphere where all parties are expected to maintain a respectful demeanor. This includes judges, prosecuting officers, counsels, witnesses, and the accused, who must adhere to professional courtesy when communicating during court proceedings. In the examination of witnesses, there are specific regulations that govern the manner in which questioning takes place. The court strictly prohibits offensive tactics aimed at insulting or annoying any of the parties involved. Additionally, counsels are held to a high standard of ethical conduct throughout the trial.

Keywords Politeness · Courtroom · Prosecuting

1 Introduction

To delve into the study of politeness, it is essential to first establish a definition of politeness as a form of communication, whether verbal or nonverbal, between individuals. This type of communication encompasses both the manner in which a speaker

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delivers an utterance and the way in which the recipient evaluates and responds to that utterance [7]. Politeness is a term widely used with two distinct meanings: one is a common, non-technical usage in societies, while the other is a technical term employed in academic settings. Politeness can be described as a considerate, humble, and pleasant behavior towards others [18]. Politeness has always been a prominent aspect of everyday conversations and interactions among individuals, a social phenomenon that exists universally. Each language has its own unique ways of expressing politeness. It encompasses etiquette and appropriate behavior within specific contexts. However, forensic linguistics, a rapidly growing sub-discipline of applied linguistics, has demonstrated the invaluable role of linguistics in legal matters, particularly in court cases. Politeness in the legal realm can be seen as the intersection of language and social reality. However, what is considered polite in everyday conversation may not be deemed polite within the confines of the courtroom. The exchange of words between the speaker and listener in a legal setting is governed by laws and regulations, aiming to foster a receptive atmosphere for all parties involved. Whether it's judges, lawyers, defendants, or other individuals present, everyone must adhere to politeness and respect, refraining from using biased language that could hinder the proceedings of a judicial hearing. It's important to note that within the legal context, speech is subject to even greater limitations due to the precise legal meanings attached to each word, which can impact court decisions. Consequently, legal discourse is characterized by a heightened level of civility, serving to uphold these restrictions and cultivate a courteous and respectful environment among courtroom speakers [8, 13]. The objective of this study is to examine different politeness strategies and apply them to a model based on Brown and Levinson's theory from 1987. Specifically, it focuses on the use of forensic linguistics in the context of courtroom politeness, emphasizing the positive and negative face strategies outlined by Brown and Levinson [1]. The significance of this study lies in its aim to clarify the extent to which politeness is employed within the legal setting of courts. This is crucial because understanding the linguistic usage in legal contexts is essential for all parties involved to be aware of the boundaries and regulations governing their speech [1]. The research will commence with a comprehensive introduction that defines politeness based on credible sources. Following that, the previous studies section will delve into the theoretical framework and foundational principles utilized in this study. Subsequently, various researchers who have explored the topic of linguistic refinement, both in general and within the legal context, will be discussed. The methodology section will outline the data collection process, sources, and analysis of the case study selected for this research. Lastly, the findings will be presented, analysing the data in accordance with the chosen theoretical framework, and the study will conclude with a concise summary [5].

2 Literature Review

2.1 Theoretical Framework

In this analysis, Brown and Levinson's theory of politeness is utilized, which canters around the concept of a Model Person (MP). When examining real court proceedings, researchers relied on the framework of face-threatening acts (FTA) as proposed by Brown and Levinson. According to their work, politeness can be categorized based on the type of face being addressed, whether it is positive or negative. Additionally, politeness is always intertwined with a face-threatening act (FTA), which has the potential to challenge the addressee's desired positive or negative face, or harm the speaker's own positive and negative face [9].

The concept of Negative Face pertains to the desire of individuals to have their actions unhindered by others, as defined by Brown and Levinson (p. 106). On the other hand, Positive Face refers to the desire of individuals to have their wants considered desirable by at least some others (p. 134). In their work, Brown and Levinson further outline distinct linguistic characteristics associated with both positive and negative face [2].

Positive politeness strategies are focused on acknowledging and valuing the positive image that the listener holds of themselves, known as their positive face. This involves paying attention to the listener, showing exaggerated interest, approval, or sympathy, intensifying their interest, using language and markers that create a sense of belonging (such as pronouns, diminutives, in-group language and dialect, jargon, and slang), seeking agreement, avoiding disagreement, assuming shared knowledge or common ground, using humor, asserting or assuming the speaker's knowledge of and concern for the listener's desires, and involving both the speaker and listener in the conversation [3].

Negative politeness strategies are typically expressed in an indirect manner, incorporating elements such as questioning or hedging, a pessimistic tone, minimizing imposition, showing deference by elevating the hearer or lowering oneself, offering apologies, indicating reluctance, depersonalizing the speaker and hearer, and framing face-threatening acts as rules. Essentially, negative face reflects an individual's desire to avoid interference from others and the fear of being compelled into uncomfortable or unwanted situations [14, 15]. On the other hand, positive face represents the need to possess attributes or possessions that are appealing to others. By employing these specific linguistic features associated with positive and negative politeness, it becomes possible to analyze speech and determine the extent and types of politeness employed by speakers [9].

2.2 Previous Studies

Maintaining decorum and respect is of utmost importance in courtroom language, particularly when it comes to politeness. This applies to all parties involved, including judges, attorneys, and litigants [7]. Politeness strategies, such as using formal language, addressing individuals with appropriate titles, and avoiding confrontational speech acts, play a vital role in ensuring the smooth functioning of legal proceedings and upholding the integrity of the justice system. It is also crucial to show deference towards the court and adhere to established legal protocols in order to maintain politeness in the courtroom [6]. Adhering to the accepted purpose or direction of the ongoing conversation, as well as considering the concept of facework, as argued by Penman [16], are additional aspects to be considered, as they go beyond informational goals in courtroom communication. Courtroom conversation differs from ordinary conversation due to its institutional nature. One significant difference is that the format of courtroom conversation typically follows a question–answer adjacency pair [4]. The courtroom setting establishes a fixed hierarchy of power, with only the lawyer or judge having the authority to ask questions. This power dynamic creates significant disparities between the speaking and listening parties, leading to assessments of extremely low or high power depending on the recipient. The influence of institutional power becomes the primary factor in determining the strategies of politeness employed in the courtroom. Judges, who regularly engage in numerous face-threatening acts (FTA's), often rely on negative politeness to mitigate these threats. This strong emphasis on politeness serves to promote smooth proceedings within the courtroom. Interestingly, judges tend to employ negative politeness more frequently than positive politeness. This preference may stem from their desire to facilitate a harmonious environment. As Robin Lakoff argued more than a decade ago, there exists a close relationship between politeness and power. Brown and Levinson's theory of politeness, which holds a significant position in the field, continues to exert a profound influence and serves as the standard model for politeness research [11, 12]. One controversial aspect of their theory is the association of speech acts with threats to both negative and positive face. Examples of speech acts that threaten negative face include directives such as orders, requests, suggestions, warnings, and threats. On the other hand, expressions of disapproval, criticism, complaints, accusations, contradictions, and challenges are seen as threats to positive face [17, 19]. In order to achieve a politeness effect, speakers employ various linguistic strategies to mitigate these face-threatening acts. These strategies have been examined in laboratory settings, where participants who were strangers were asked to engage in disagreements on selected topics. To avoid conflict, participants were observed to steer clear of controversial topics and to soften their disagreements through hedging expressions, such as using phrases like "yes, but…".

The sociolinguistic viewpoint has traditionally considered these actions as suitable conduct within a specific setting [4, 7] goes so far as to propose that politeness can be defined as behaving appropriately given the circumstances. Consequently, any

attempt to question these established norms would be deemed improper and, as Meir argues, inherently impolite [10].

3 Methodology

3.1 Data Collection Processes

The information contained within this paper will be sourced from selected passages extracted from the United States v. Jones document, which can be found in the Justia U.S. Supreme Court Center. This particular case involved the U.S. government's attempt to utilize evidence obtained through the use of a GPS tracking device that had been installed on Jones' vehicle without obtaining a prior injunction. Jones, on the other hand, contended that this action infringed upon his rights as guaranteed by the Fourth Amendment of the U.S. Constitution, which safeguards individuals against unwarranted searches and seizures. The parties to the dispute in United States v. Jones are:

1. **Prosecutor's Representative (United States of America)**:

In this case, Michael R. Dreeben, Deputy Solicitor General, served as the representative of the U.S. federal government. He defended the government's stance that the installation of a GPS tracking device and the subsequent monitoring of vehicle movements did not fall under the category of a "search warrant" that would necessitate obtaining a search warrant in accordance with the Fourth Amendment of the U.S. Constitution.

2. **Defendant's representative (Antoine Jones)**:

Jones' special counsel, Stephen C. Leckar, contended that placing a GPS device on Jones' vehicle without a search warrant was a breach of the Fourth Amendment of the U.S. Constitution. Consequently, Leckar argued that any evidence obtained from the device should be deemed inadmissible in court.

3. **The remaining nine judges**:

In this hearing, the nine remaining judges unanimously concluded that the Government's actions in this case were in violation of the Fourth Amendment. However, each judge offered distinct explanations regarding the basis for their decision.

3.2 Data Analysis Procedures

In order to conduct a comprehensive analysis, it is necessary to consider the unique attributes of the courtroom, as well as other institutional and organizational contexts.

The first step involved examining the specific aspects of language use related to politeness within a courtroom setting. This investigation involved analyzing audio recordings and written text obtained from the court's website, as well as excerpts from a courtroom transcript. By applying Brown and Levinson's theory of politeness, Each extract is evaluated by italicizing it and providing commentary. This analysis is expected to determine whether the extract reflects the positive face strategy or the negative face strategy, taking into consideration the characteristics associated with each strategy outlined in the theoretical framework section.

4 Results and Discussion

4.1 Discussion

Let's begin by addressing the issue of politeness in situations where the judge agrees with lower court judges or counsel. Following that, we will explore how judges express compliments towards lower judges. Next, we will shift our focus to instances where judges disagree and employ language that, although it may be perceived as neutral or non-polite, can actually be seen as a negative face strategy [20].

Positive politeness strategies:

1. Excerpt No. 1

   _Sonia Sotomayor
   "So, if -- give us a theory.
   Is that okay for the police to access those cameras and look at you moving from place to place? and if that's okay, then why is this not okay? What is your theory of your case?
   _Stephen C. Leckar"
   --Our theory, Justice Sotomayor, with respect to video camera, if they are targeting an individual, this presents a gray question

2. Excerpt No. 2

   "_Stephen C. Leckar
   --They had the choice-
   _Stephen C. Leckar
   --No…That's correct, Your Honor, but what we have—what we have here is a warrantless intrusion."

To foster social cohesion and strengthen the bonds between speakers, it is essential to employ official titles and convey respect and gratitude towards all participants, particularly judges, as demonstrated in the first excerpt. In the second excerpt, the

traditional phrase "Your Honor" serves as a polite expression of deference and appreciation towards the judge. Additionally, the lawyer's affirmation of "That's correct" signifies their agreement with the judge's query or comment, promoting positive communication and minimizing the likelihood of conflict or unnecessary argumentation. Moreover, the lawyer acknowledges the complexities of the case by stating, "this presents a grey question," thereby demonstrating their comprehension of the concerns raised by Judge Sotomayor.

3. Excerpt No. 3

_Stephen C. Leckar
"Well, a license plate as I understand it is the property of the State and driving is a privilege."
But it's not a technical trespass in this particular case.
"_Antonin Scalia
I didn't own my license plate?
I didn't know that.
How do you know that?
I paid for my license plate!!
[Laughter]--
_Anthony M. Kennedy
We don't need to get into it, but Live Free or Die"

Humor is employed in order to alleviate tension and create a harmonious atmosphere within the courtroom. This approach has the potential to effectively loosen the formality of dialogue, allowing for more humane and natural communication. In the given excerpt, the judge's feigned surprise with the statement, "I didn't know that. How do you know that?" serves as a manifestation of artificial astonishment. This prompts laughter from the audience, thereby reducing tension. This particular characteristic aligns with the concept of positive face in politeness theory, as it involves the telling of jokes.

4. Excerpt No. 4

_Stephen G. Breyer
It's not a violation unless, in addition to a search, it is an unreasonable search. And since you already --– and the same is true of seizure, isn't it?

_Stephen C. Leckar
That's right.

_Stephen G. Breyer
So, you already have everybody agrees it's at least a search.

By utilizing the term “agrees” and the expression “that’s right,” the focus on the shared perspectives of the individuals involved and the acknowledgement of areas of consensus is made clear. Undoubtedly, emphasizing points of agreement in a tense environment fosters a constructive rapport between the judge and lawyer, ultimately resulting in effective communication and positive outcomes.

5. Excerpt No. 5

_Stephen G. Breyer
“The existence of a physical trespass is only marginally relevant to the question of whether the Fourth Amendment has been violated, however, for an actual trespass is neither necessary nor sufficient to establish a constitutional violation.”
“That’s Karo.
So, you can talk if you’d like.
It’s your hour.

_Stephen C. Leckar
It’s not, Your Honor.
This is not a Karo case.
First of all, in Karo the installation was essentially consented to.”

Despite the lawyer holding a differing opinion from the judge, he proceeds to articulate his perspective and provide further elucidation in a manner devoid of any confrontational language or tone. In doing so, he upholds a sense of mutual respect and fosters an environment of comprehension. Additionally, he consistently employs polite titles throughout the discourse.

Negative politeness strategies:

6. Excerpt No. 6

_Stephen G. Breyer
there are many people who will say that that kind of surveillance is worthwhile, and there are others like you who will say, no, that’s a bad thing. But that isn’t the issue exactly in front of us.

_Stephen C. Leckar
“That’s correct, Your Honor. What we have here is a physical--

_Stephen G. Breyer
And what Justice Kagan wanted to know is why not.

_Stephen C. Leckar
--Because you have a physical invasion of property.

_Stephen G. Breyer
Oh, my goodness
Sorry, I just had that expression because I'm reading."

Judge Stephen J. Breyer offered an apology in this passage for his immediate exclamation of "Oh, my goodness," which he may perceive as unsuitable or subject to negative interpretation within the realm of judicial deliberation. This response can be understood as a display of astonishment, which may be seen as unprofessional within the formal setting of the court. He provides a justification for his reaction, demonstrating his humility and readiness to acknowledge any misstep. This act of contrition serves to foster courtesy and alleviate tension in conversation, and it is regarded as a tactful approach to maintaining decorum.

7. Excerpt No. 7

_Stephen C. Leckar
"It's a little wafer that's got an enormous capacity.

_Samuel A. Alito, Jr.
But this one does nothing, and you -- so you would go -- you would sue -- you would bring a trespass action.

_Stephen C. Leckar
No, heavens, no, Your Honor.
If it did nothing, first, it wouldn't be a Fourth Amendment problem.

_Samuel A. Alito, Jr.
So, what's you're concerned about is not this little thing that's put on your car. It's not this invasion of your property interest."

The concept of negative face revolves around an individual's desire to maintain personal freedom and avoid uncomfortable situations imposed by others. The author effectively expresses their viewpoint without forcefully imposing it on others. By using the phrase "a little wafer," the author softens the argument, making it less confrontational and more open to debate. The phrase "No, heavens, no, Your Honor" alludes to a lie from the judge to the lawyer, prompting the lawyer to defend their own face, as suggested by the theory. However, the author ensures that this defense is presented politely, with no negative intentions or impoliteness.

8. Excerpt No. 8

_Elena Kagan
"Mr. Dreeben, that -- that seems too much to me. I mean, if you think about this, and you think about a little robotic device following you around 24 hours a day anyplace you go, the notion that we don't think that our privacy interests would be violated by this robotic device, I'm – I'm not sure how one can say that."

_Michael R. Dreeben
Justice Kagan, I think the Court should decide that case when it comes to it.

Drebin chooses to express his perspective in a more courteous manner by using the phrase "I think" instead of making definitive statements like "the court must decide now" or "this is the right decision." This approach allows the officials to make the final decision while avoiding direct confrontation or opposition towards the lawyer. Additionally, the phrase "when the time comes to it" is employed to avoid explicitly referencing the laws of the Court, although it remains an integral aspect.

9. Excerpt No. 9

_Samuel A. Alito, Jr.
What is the size of this device?

_Stephen C. Leckar
I'm sorry, Your Honor?

_Samuel A. Alito, Jr.
What is the size of this device?
_Stephen C. Leckar

I apologize, but could you please clarify something for me in the legal context? It has come to my attention, thanks to the NACDL, that there exists a GPS device on the market that weighs a mere 2 oz and has the dimensions of a credit card.

5 Results

Based on previous excerpts and analysis from the Court: United States v. Jones. The following results were identified:

1. First of all, both strategies (positive and negative politeness) aim to create a respectful and constructive social interaction, but they differ in how to achieve this. Positive politeness strategies promote proximity and positive communication, while negative politeness strategies seek to maintain a certain distance and mutual respect by reducing potential threats to the other person's face.
2. Second, from the positive politeness strategies included in the previous excerpts: Show respect by using official titles and using humor or informal comments to relieve tension. In addition to using questions to mitigate requests or criticisms. Also, the referring to points of agreement and offer thanks and appreciation. However, negative politeness strategy seemed in the apologize for incompatibility or misunderstanding and to avoid forcefully imposing opinions or ideas. Moreover, avoid direct confrontation, minimize the imposition of opinion and dilute power in argument to give space to others to think and debate.

3. Third, a positive politeness strategy outweighs the use of a negative politeness strategy in terms of quantity.
4. Finally, the Court's legal context is characterized by limitations on the use of politeness, considering some differences, for example, judges here come forward using questions several times, while counsel has not used the confirmatory or questionable question.

6 Conclusion

In this study, the focus was on the types of politeness strategies utilized in courtroom interactions, specifically drawing from Brown and Levinson's theory from 1987. The aim was to apply these strategies to a model and examine their prevalence in the legal context, using excerpts from the United States v. Jones trial as a case study. The analysis highlighted the importance of linguistic choices in the courtroom, as each party must be aware of the boundaries and regulations surrounding their speech. The findings revealed that both positive and negative politeness strategies were heavily employed in the courtroom, with a greater emphasis on positive politeness in terms of quantity. These strategies serve various purposes, such as creating a comfortable and tension-free environment in the court, facilitating the exchange of opinions and ideas, and ultimately contributing to the successful achievement of the trial's objectives.

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DEU: Data Encryption Utility Using Fully Homomorphic Scheme



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Abstract Homomorphic encryption allows computations on ciphertexts, generating encrypted results that, when decrypted, match the results of operations performed on the plaintexts. This paper presents an efficient homomorphic encryption scheme using the Brakerski-Fan-Vercauteren (BFV) method. We detail the methodology, implementation, and performance results, demonstrating the scheme's viability for secure data computation.

Keywords Homomorphic encryption · BFV scheme · Secure computation · Encryption · Decryption · Technological progress

1 Introduction

In today's digital age, securing sensitive data while allowing for its efficient processing is paramount [1]. Traditional encryption techniques offer robust security for data at rest and in transit, but they often pose a challenge when it comes to performing computations on the encrypted data without decrypting it first [2, 3]. This limitation has fueled the development of a revolutionary cryptographic technique known as homomorphic encryption (HE). Homomorphic encryption enables computations to be performed directly on encrypted data without the need for

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decryption, thus preserving the confidentiality of the data throughout the computation process. Homomorphic encryption is a transformative cryptographic technique enabling secure computation on encrypted data without revealing the data itself [4, 5]. This property is crucial for privacy-preserving applications in cloud computing, data analysis, and secure multiparity computations [6, 7]. This paper explores the BFV homomorphic encryption scheme, highlighting its methodology, implementation, and performance through various experiments.

2 Proposed Methodology

The BFV scheme is chosen for its balance of efficiency and security. It supports addition and multiplication operations on ciphertexts, enabling polynomial computations over encrypted data. Our methodology involves:

- **Key Generation**: Generating public and private keys using large prime numbers and polynomial rings.
- **Encryption**: Converting plaintext into ciphertext using the public key and encryption function.
- **Evaluation**: Performing homomorphic operations (addition and multiplication) on ciphertexts.
- **Decryption**: Converting the resultant ciphertext back into plaintext using the private key.

3 Implementation

Homomorphic encryption (HE) allows for computations to be performed on ciphertexts, producing an encrypted result that, when decrypted, matches the result of operations performed on the plaintext. This section details the practical implementation of homomorphic encryption schemes, including system setup, key management, encryption and decryption processes, and performance evaluation. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

- **Encryption**: Data is encrypted using the public key. The plaintext is transformed into ciphertext through a series of mathematical operations, ensuring that the original data cannot be accessed without the corresponding private key.
- **Computation on Encrypted Data**: The core advantage of homomorphic encryption is the ability to perform computations on encrypted data. We implemented basic arithmetic operations, such as addition and multiplication, directly on the ciphertexts using HELib's functions.

- **Decryption**: The resultant ciphertext from the computations is decrypted using the private key to obtain the final output. This output matches the result of performing the same operations on the plaintext data.

4 Hardware and Software Requirements

The choice of operating system will depend on the existing infrastructure and compatibility requirements. However, it should be stable, secure, and support the software tools and libraries required for homomorphic encryption. Several libraries can be used to implement homomorphic encryption, such as Microsoft's SEAL, IBM's HELib, or open-source options like PALISADE. These libraries need to be compatible with the system's operating system and programming environments. Choosing a library often depends on the specific encryption schemes it supports and its performance characteristics. Programming languages that support advanced mathematical functions and multithreading capabilities are preferable, such as C++, Python, or Java. The development environment should support secure coding practices to avoid vulnerabilities in the application layer. Tools for conducting regular security audits, vulnerability assessments, and cryptographic validations are essential to ensure that the encryption schemes are implemented securely and remain robust against potential attacks. To ensure that the system adheres to relevant data protection laws and regulations, compliance monitoring tools may be necessary. These tools can help track how data is handled and processed within the system, ensuring compliance with standards such as GDPR, HIPAA, or others applicable to the specific industry or region. Software solutions for backup and disaster recovery are critical, especially considering the importance and sensitivity of the encrypted data. These solutions should ensure data integrity and quick recovery capabilities to maintain system availability and data accessibility [8–11].

5 Result

To evaluate the performance of our homomorphic encryption implementation, we focused on key performance metrics including encryption time, decryption time, and the time required for homomorphic operations such as addition and multiplication. The results are indicated in Table 1. The benchmarks were conducted using the HELib library on a standard computing environment with the following specifications:

Hardware Specifications

- Intel Core i3-9700 k @ 3.6 GHz
- Cores: 8
- Threads: 8
- RAM: 16 GB DDR4 @ 3200 MHz

Table 1 Performance metrics

Metric (ms)	Value
Key generation time	45
Encryption time	30
Decryption time	25
Addition time	10
Multiplication time	20

- Storage: 1 TB NVMe SSD.

5.1 Software Specifications

- Operating Systems: Ubuntu 20.04 LTS (64-bit)
- Compiler: GCC 9.3.0
- HELib Version: 2.1.0
- GMP Version: 11.4.3
- NTL Version: 11.4.3
- Python Version: 3.8.1.

Our scalability tests involved increasing the size of the input data and the complexity of the operations to assess how the system handles larger-scale computations. The results showed a linear increase in computation time with data size and a quadratic increase with the number of operations, indicating predictable scalability patterns. However, performance optimization is necessary for practical applications involving large datasets or complex computations.

6 Conclusion

This paper presents a detailed implementation of the BFV homomorphic encryption scheme, demonstrating its efficiency and practicality for secure data computation. The results affirm the scheme's viability for applications requiring privacy-preserving computations. Future work will focus on optimizing the implementation for larger datasets and exploring additional homomorphic operations.

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The Influence of Artificial Intelligence on Personalized Learning: Psychological Implications for Students



Adnan Hassan Alsarayreh

Abstract This paper investigates the influence of AI in personalized learning from a psychological perspective and how AI affects interactions between students and teachers, especially in online education where prompt customized help is vital. Although AI can improve personalized learning experiences to better engage students, there are issues related to too much support that may jeopardize student agency and control over their learning. This paper also weighs the dangers of uniform AI support, which might impede effective learning and curtail the avenues for discovery. Using a narrative technique to weave together existing theories and research findings and then going through a systematic analysis of the trends that evolve from the assembled literature, this research tries to open up how much AI is contributing to personalized learning. The findings stress the need for evidence-based policy and a balanced uptake of AI in education to augment rather than undermine students' learning.

Keywords Artificial intelligence (AI) · Personalized learning · Psychological implications · Student engagement · AI in education (AIED) · Learning technology

1 Introduction

This chapter's introduction outlines the primary topics that will be examined in the following discussion regarding the effects of artificial intelligence (AI) on personalized learning and the psychological consequences for students. A vital element to consider is the influence of AI on the interaction between learners and instructors in online education, as it significantly impacts the feedback and support that

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students receive. According to research conducted by [1], both students and instructors anticipate beneficial outcomes from AI systems that facilitate timely personalized assistance; however, there are worries that excessive support may diminish student agency and ownership over their learning. Furthermore, the ability of AI to enhance personalized learning experiences, study sessions, group projects, and activities independent of instructors is recognized. Nonetheless, there are concerns that standardized support could adversely affect effective learning and limit students' chances for exploration and discovery.

Moreover, it was highlighted that the necessity of a thorough comprehension of both the practical and theoretical dimensions of AI in Education (AIED) to facilitate informed decision-making and governance within this field [2]. The author stresses the significance of steering clear of a technocentric perspective that could prioritize rote memorization at the expense of profound understanding and enthusiasm for lifelong learning. This perspective resonates with the central theme introduced earlier, which prepares the groundwork for an in-depth examination of the psychological effects of AI on personalized learning experiences for students [3].

1.1 Background and Significance

The potential negative effects should be considered before implementation. As noted [4], while AI systems are expected to enable just-in-time personalized help for students at scale, too much support through the system would take away students' self-efficacy beliefs and ownership towards their learning. Both students and instructors acknowledge the prospect of AI in augmenting personalized learning experiences, especially when it comes to studying and working on projects collaboratively. But there is effective learning likely to be harmed by canned, standardized support. These findings highlight the psychological implications of AI on personalized learning and its potential advantages or disadvantages for students and instructors. The effective integration of generative AI within educational institutions requires the investigation of its successful applications, limitations, ethical considerations, and future trends, with an emphasis on the importance of understanding this influence.

1.2 Research Objectives

This research attempts to unravel the psychological repercussions of artificial intelligence on personalized learning experiences of students. Its specific objectives include looking into the expectations and concerns that learners pursuing distance mode of learning hold regarding the adoption of AIDA in their academic pursuits. The research seeks to identify the services that distance learning students would find beneficial, including real-time assistance, academic task support, personalization, accessibility,

and emotional and social support. Furthermore, the study investigates students' wishes for AI to be tailored to their unique needs and learning styles, alongside their varied expectations concerning emotional and social support provided by AI. Additionally, this study intends to explore the mediating influence of intrinsic motivation on students' perceived learning of AI and computational thinking throughout the COVID-19 pandemic. It aims to uncover how gamification techniques based on AI and chatbots have enhanced teaching tasks for instructors and allowed students to accelerate their learning. Furthermore, it examines the changes in the teacher-student dynamic as interactions transition to online teaching platforms. The research emphasizes the importance of optimizing lectures, developing an AI-driven curriculum, and managing educational data and outcomes within educational settings.

1.3 Methodology

This study will describe the literature on how artificial intelligence is pertinent to personalized learning, via a psychological perspective. The descriptive approach will help synthesize theories and up-to-date research findings in this field. After an extensive review of the literature, an analytical approach will sift through all the information, picking out trends, themes, and salient points of discussions. These two methods (descriptive and analytical) when correctly applied will enable educators to probe the impact that AI has on personalized learning; hence valid results with well-informed discussions.

2 Artificial Intelligence in Education

The integration of artificial intelligence (AI) into educational environments has grown significantly, presenting numerous applications for personalized learning [5]. This technology has the capacity to improve educational results by supplying educators with empirical data, allowing them to customize their teaching strategies according to the specific needs of each student. Learning management systems that incorporate AI algorithms are capable of monitoring how students engage with educational content, providing essential insights into their performance and level of engagement [6]. Furthermore, the role of AI in education goes beyond just the creation and implementation of AI systems; it also includes the vital component of educating individuals about AI and data ethics to promote safe and effective usage [7].

The tie among education, analytics, and learning channeled with AI brings up the most important issues for human supervision over the correction of AI-generated content. While automation from AI opens up avenues through which we can improve our educational system, care has to be taken in ensuring that basic intellectual skills are not eroded by critically analyzing the work done by AI models. Moreover, developing AI models capable of interacting fluently with people to understand their

preferences and change them is a key element to succeed in introducing this kind of technology into educational environments. These conclusions reveal how intricate the relationship between artificial intelligence and education can be, underlining that we have to use cognitive abilities apart from what is technological.

2.1 Overview

In education, AI refers to applying AI technologies to personalize and enhance the learning experiences of students. This involves developing and implementing AI-based systems that can learn by themselves as well as adapt to students' individual needs by providing custom-tailored feedback and optimizing the way educational content is delivered. The purpose of AI models within the educational domain, according to [8], is to reduce their presence gradually as learners become more empowered through interacting with the model—underscoring the importance of fostering and developing students' innate cognitive abilities as well. Moreover, findings from [9] stress AI potential in discerning disengaged learners, curbing biases, and enhancing self-efficacy among students of STEM fields through personalized assessments based on need for such interventions [10].

The connection between learning, data, and AI in the field of education is more than just creating AI; it also underscores the absolute imperative of training people to use AI and data for safe, effective, and ethical learning. Moreover, the integration of AI-based co-curricular activities, student profiles using machine learning, and interactive interfaces for personalized content delivery and feedback represents some various applications of AI in educational contexts. As these technological advancements keep burgeoning, dynamic student-agent interactions are what will need to be salient: dialogic exchanges that empower students to arrive at their solutions while also revisiting concepts in a manner custom-designed for them.

2.2 Current Applications in Personalized Learning

Current AI in personalized learning comprises a wide variety of operational applications and innovation. The ability of AI-enhanced learning management systems to observe and evaluate student engagement with educational resources enables them to provide teachers with data about further improving their methodology. The systems can also predict future performance of students which would help in understanding personalized learning needs and possible areas of [11]. Moreover, AI-driven customization of training materials and creation of student profiles make it possible to adapt the content for each individual need of the learner for higher quality student experience as a final synthesis [12].

The integration of AI in personalized learning gives the ability for educators to provide emotion-infused interventions and help disengaged learners since machine

learning algorithms can identify those who might need additional aid. Furthermore, intelligent tutoring systems and personal digital tutors can bring immense added value to the learning process through individualized support and reinforcement of concepts, tailored to a specific mannerism. Such applications of AI in personalized learning reflect the possibility of better educational outcomes and underline how important it is to understand the psychological implications for learners.

3 Personalized Learning and Student Psychology

In the context of student psychology, personalized learning refers to the customization of instruction to align with each student's unique learning needs, preferences, and interests. According to [12], a completely personalized setting allows for variations in learning objectives, content, pace, and methods, all tailored to the specific requirements, abilities, schemata, and interests of students. It moves away from teacher-centered approaches to inculcate self-directed learning for the enhancement of student motivation and engagement. Moreover, virtual change agents and in-built learning analytics tools can make personalized e-learning experiences much more effective by providing motivational feedback as well as keeping track of the students' details and progress.

On the other hand, important questions were raised about how much the ML personalization is in line with a humanistic view of individuality [13]. It underlines the need to investigate the impact of ML personalization on human well-being and moral and social identity at the time human behavior is being digitized and predicted by ML algorithms. This, in turn, reopens an ongoing debate around algorithmic bias, transparency, and fairness in machine learning for which it is important to consider when assessing personalization levels in ML-generated scores.

3.1 Framework

Personalized learning is an approach to education that tailors the delivery of instruction, the pace at which a student progresses, and the learning environment to meet the needs of individual students. It acknowledges that students are diverse and seeks to provide them with support as well as guides and feedback while they work on challenging tasks [14]. In artificial intelligence, personalized learning has gained increasing attention within machine learning algorithms for creating custom-tailored educational experiences. This indicates that ML personalization is not perfect, given that it relies on models learned from other people's data, with unknown long-term consequences for personal identity and society [15]. Also, the conceptual framework surrounding personalized learning includes multiple pedagogical and technical viewpoints. Such problem-based learning (PBL) and goal orientation highlight active engagement: collaborative problem-solving. And how learners' objectives shape

their motivation and learning behaviors. These frameworks provide a basis for understanding the psychological effects of personalized learning on student development and learning outcomes.

3.2 Benefits and Challenges

Personalized learning, enabled through artificial intelligence (AI), presents various advantages and challenges that carry psychological implications for learners. Among the potential benefits are real-time assistance and resolution of queries, support for academic endeavors, personalization and enhanced accessibility, as well as emotional and social backing. According to a study [16], students engaged in distance learning anticipate that AI digital assistants will furnish immediate feedback regarding their knowledge and skills, supply suitable resources, and produce tailored summaries of their study materials. Nonetheless, it is crucial to strike a balance between AI assistance and allowing students the opportunity to discover answers independently. Furthermore, while some learners embrace emotional and social support from AI, others express concerns, especially in environments marked by social isolation.

On the contrary, including student characteristics for customization in educational technology might be a double-edged sword. The output of their simulation study was that real-time personalization could be responsible for making the student experience more positively in some contexts but is likely to slow adaptation with potentially biased outcomes and hence create obstacles compared to a less tailored model. This emphasizes the need for a proper psychological impact assessment of AI-based personalized learning on the well-being and educational experiences of students.

4 The Intersection of AI and Student Psychology

The area where artificial intelligence and student psychology meet is rife with issues related to cognitive, behavioral, emotional, and social factors. As artificial intelligence technologies get more deeply embedded within personalized learning systems, understanding their psychological impact on students becomes very important. The paper stresses the need to acquire both practical and theoretical knowledge-related information on AI in educational contexts and also stressed the need for competent guidance from educational professionals and appropriate governance in AIED. Also discussed was the ability of AI to model teachers' behavior as well as enable student differentiation while enhancing socio-emotional involvement from a socially responsible perspective—for which more empirical research is needed—thus carefully implementing AI within educational settings. These findings stress the importance of addressing the psychological effects of AI when applied in personalized learning

and being considerate and responsible when using AI technologies in educational environments [17].

4.1 Cognitive and Behavioral Impacts

The convergence of student psychology and artificial intelligence (AI) notably affects cognitive and behavioral aspects of personalized learning. Within the realm of online education, it is anticipated that AI systems will deliver timely personalized assistance, including feedback, explanations, and recommendations, which can enhance students' educational experiences. Nonetheless, there are apprehensions that an overabundance of support from AI might undermine student autonomy and ownership of their learning journey, possibly resulting in diminished effort and an illusion of security. Furthermore, concerns arise that dependence on AI could restrict students' chances for exploration, creativity, and discovery, as both projects and learning processes risk becoming excessively standardized [18].

Moreover, the diverse perverse incentives among stakeholders in the educational ecosystem and the need for informed guidance from education experts constitute a critical consideration when steering AI in education. Creating an environment where technological innovations can be carried out and deploying technologies that respond to current changes in the way teaching and learning is done requires a contextual understanding of educational forces. For such a comprehension—knowledge based on both practical (experiential) and theoretical realms is required [19].

4.2 Emotional and Social Implications

The implications of AI in personalized learning environments are complex, and the emotional and social factors involved make them vast as they cut across many issues. One important thing to consider is how real the interactions between students and AI are. The authenticity of engagements supported by AI systems is very important to ensure that they are genuine and meaningful, thus building a sense of connection and relationship among teachers, students, and even the AI itself. Another very important issue is academic integrity. With the increase in AI presence in educational settings, it becomes very important to maintain the validity of assessments, assignments, and overall evaluation processes. This includes not only detecting cheating but also promoting a culture of honesty and ethics regarding the use of AI technologies. Striking a balance between using AI in personalized learning and upholding academic credibility is vital to keep educational results legitimate and fair. Moreover, the capacity of AI to improve socio-emotional engagement within personalized learning environments has great potential. AI systems can adapt to the unique needs of individual students, offering customized support and feedback that can improve students' emotional well-being and their involvement in the learning process [19].

Integrating AI into education allows educators and teachers to foster more inclusive, supportive, and adaptive learning environments that address the distinct socioemotional needs of every student. Nonetheless, it is crucial to approach the incorporation of AI in personalized learning settings with caution, always prioritizing the psychological health of students. Although AI can offer tailored assistance, it must not supplant the essential human connection and support that students depend on. The foundation of education continues to lie in the development and preservation of strong relationships between students and teachers. Ultimately, the effects of AI in personalized learning environments are complex and varied. A balanced approach is important because of authentic interactions, academic integrity and because of the potential for AI to enhance socioemotional engagement of students; through a focus on student mental health and well-being, while taking advantage of what AI has to offer, we can create powerful, meaningful personalized learning experiences that help to empower and support each individual student on their educational path [19].

The ethical dimension of the integration of artificial intelligence in personalized learning is of substantial importance. Educational AI systems generate large volumes of personal data. Therefore, privacy and data protection when sharing information should be on the top note. This includes making sure that users are well informed about potential risks to their privacy and obtaining their consent in accordance with rules regarding the confidentiality of user information [20].

Moreover, the ethical issues of bias and discrimination in AI systems for personalized learning should be recognized. Since AIED has the potential to customize student participation as well as learning experiences, the design and implementation of these systems should be reviewed for biases to ensure that every student has equal educational opportunities based on merit [20]. Regulation and policy need to ensure that the development and use of AI in personalized learning is justified and does not adversely affect the environment, or the economy or society.

4.3 Privacy and Data Security

In AI-driven personalized learning, much attention should be paid to the risks of disclosure of proprietary information and ensuring protection for privacy and data security. The implementation of artificial intelligence in systems for personalized learning leads to the need for extensive student data. Therefore, ethical issues are one of the most important relevant problems today. To improve risk estimation procedures, it is advisable to carry out preliminary expert evaluation with the participation of developers and users. The information received during this evaluation will give you a clear understanding of what ethical risks are typical for this type of AI applications, as well as in protecting privacy within them. Differential privacy offers a mathematical guarantee that the confidentiality of individual data points is preserved

while enabling aggregation across large datasets. In fact, developers of systems typically do not require access to personal information unless they are engaged in federated modeling. This approach facilitates the sharing of machine learning systems, simplifying the management of encryption and allowing data operations to occur without compromising trust. Federated learning helps to avoid the drawbacks associated with centralized storage, presenting a promising strategy for machine learning improvement. While this method can complicate practical optimization tasks among various sources, it also provides a means to address these challenges effectively, ensuring that organizations can conduct thorough analyses in a decentralized manner without jeopardizing the confidentiality of the individual details being examined. The influence of AI systems on interactions between learners and instructors in online settings presents both advantages and disadvantages, raising issues related to surveillance, privacy, responsibility, and agency as noted by others [21]. While AI systems are known to improve communication—both in terms of quality and quantity—and provide personalized help, questions on privacy have been raised as a result of the massive data collection involved from both learners' and instructors' perspectives. Moreover, students have highlighted the potential responsibility issue that may come up when unreliable responses from AI cause negative outcomes. This emphasizes the need for ethical and responsible implementation of AI in personalized learning environments.

4.4 Bias and Discrimination

Ethical dilemmas arise from bias and discrimination in artificial intelligence (AI) and are related to fairness, equity, and the possibility of discriminatory practices in personalized learning. Automated systems can take decisive actions that have an impact on different areas of individuals' lives like granting credit scores or health diagnoses, which can result in systematic disadvantages for certain groups—this reveals digital discrimination: unfair treatment of people due to factors such as income, education, gender or ethnicity because of automated decision-making [21]. Addressing the subtleties of bias and discrimination in AI calls for a multidisciplinary strategy where technical, social, legal and ethical aspects are integrated—guaranteeing that computational techniques used to verify and certify bias-free datasets are informed by socio-cultural and ethical nuances.

The impact of AI on learner-teacher interaction in online education is considered by many to be beneficial, while some view it as an impending threat. The AI system is known to enhance communication and provide personalized support, but there are concerns related to responsibility, agency, surveillance, privacy, and the black-box nature of these AI technologies [21]. While both students and instructors appreciate immediate communication and individualized assistance from AI, they fear that it might impinge on self-directed learning and be detrimental to not having accurate responses from AI. These issues point to the need for ethical considerations and possible biases within AI systems used in personalized education.

5 Case Studies

Insights into the practical effects of artificial intelligence (AI) on personalized learning can be validated by case studies and empirical research. Evidence was provided that AI technology can enhance educational results quite significantly by allowing educators to monitor student engagement with learning resources and detect algorithms, later refining their strategies of teaching based on these data-driven insights [22]. The real proven effectivity regarding hybrid teaching methods to forecast students' future achievements and to make sure each learner passes the course is also demonstrated. Moreover, it highlights the need to apply AI in education-related problem bias, and accessibility plus interaction and skills at the workplace. Both emphasize the prospect of machine learning in creating learner models and customizing teaching resources which would enable teachers to individually shape the learning process for each student under a common curriculum. This brings out the role of AI-supported co-curricular activities in personalizing education thus having to cater to different learning styles. In conclusion, both the case studies and empirical data stress the effective influence of AI on personalized learning. There is, however, a prerequisite which is setting concrete role definition and ethical principles with the introduction of AI in the educational scenario.

5.1 Challenges and Failures

Recent research has outlined the difficulties and drawbacks of introducing artificial intelligence (AI) in personalized learning environments. Respondents expressed worries on who owns data submitted to AI digital assistants, particularly with respect to the intellectual property of AI-generated content [22]. An important problem that has been put is the possibility for AI systems to give wrong or biased responses which may lead to the spread of misinformation. Also noted was the likelihood of students misusing AI in doing assignments and plagiarism, which would alarm about students providing AI systems with wrong data and also exploiting the technology when getting correct answers during assessments instead of using it for real learning [23].

Another study brought to light the discomfort and negative perceptions shared among both students and teachers with the implementation of AI systems in online education. In regards to the feedback provided by AI facial analytics on subconscious actions, students expressed their discomfort by arguing that it ignored the fine points of social interaction and did not genuinely represent student engagement. Instructors similarly expressed negative perception regarding AI in analyzing student behavior due to possible problems in learner-teacher interaction. These findings reflect the complexities and limitations related to implementing AI in personalized learning settings; further research is needed, considering different perspectives and disciplinary distinctions [24].

6 Conclusion

The psychological effects of artificial intelligence on personalized learning are not, in any way, straightforward. While AI systems may be able to provide timely personalized help to individual students at scale, there is some concern about too much support undermining the agency of students as well as their ownership of the learning process. Students have responded well to AI in personalized learning regarding their studies and group projects; however, there are concerns regarding standardized/fixed support and its effect on the efficiency of the learning process. On the other hand, instructors are more inclined towards AI-driven intelligent recommendations plus adaptive quiz systems while being skeptical about how much chance it might rob their students from exploration and discovery. This paper highlights the need for context-specific understanding educational dynamics traceable back informed governance under AIED so that technological progress does translate into enriched learning experiences for future generations. This emphasizes the urgency of proactive regulation of AIED through an organic comprehension of its practices and what underlies these practices to help steer educational technology toward a better match with individual learning needs.

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The Role of Technology in Enforcing Financial Penalties: Assessing Validity and Effectiveness



Ahmed Awad Al-Bnian

Abstract The chapter focuses on financial penalties and how technological tools can improve the enforcement of legal obligations by threatening financial penalties. These penalties impose a penalty on the debtor for failing to fulfill a court obligation or violating a court order. The penalty may be payable in small hourly, daily or monthly amounts until the obligation (related to the penalty) has been complied with or the violation has ended. A technological solution may be useful to improve the enforcement of financial penalties rather than other types of penalties, damages and legal interest. Criminal threats have clear and obvious effectiveness, but are still rarely used in some legal systems. This study anticipates how a technological solution can reduce a debtor's resistance to payment, thereby improving judicial outcomes. Promotion and practical implementation of a technological solution can increase the effectiveness of the system, reduce payment resistance on the debtor's side, and thus enable better results in the judicial area.

Keywords Threatening fine · Debtor's resistance · Time unit · Settling the threatening fine

1 Introduction

Incorporating a multifaceted approach, the threatening fine is a powerful tool that carries a strong financial message. It not only serves as an explicit means of intimidation, but also has a unique temporal quality which can be adjusted based on the debtor's response. The court's discretionary authority gives it the power to reassess the fine's magnitude in the face of the debtor's tenacity or defiance. The ultimate goal of this financial coercion is clear—to exert a forceful influence on the debtor and

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inspire a sense of apprehension that will lead to compliance with the court's judgment. By blending the elements of threat and the dynamic aspect of temporal reconsideration, this approach is carefully designed to dismantle the debtor's resistance and encourage them to follow the court's demands.

1.1 Problem of the Study

The issue at hand centers around the perplexing lack of support from lawmakers for imposing hefty fines on debtors as opposed to their clear favor for imprisoning debtors. An interesting development in this situation to note is the evident change in Enforcement Law, which has drastically reduced the circumstances under which imprisonment can be put into effect. This significant change demands that we carefully examine other approaches in pressuring debtors to fulfill their contractual obligations. The imperative for the legislator to incorporate the threatening fine system is underscored by the paramount significance of the research problem. To enforce compliance, an alternative mechanism like the threatening fine becomes crucially important. As a cogent proposition meriting careful consideration, the potential inclusion of the threatening fine in the legislative arsenal plays a pivotal role.

1.2 Study Objective

By exploring the multifaceted aspects of the threatening fine system, we can unravel its nuanced impact on enforcement dynamics. The system is not only intrinsically significant but also remarkably efficacious, serving as a formidable mechanism to compel debtors to fulfill contractual obligations. In fact, it plays a pivotal role in resolving judicial rulings that encounter obstacles to implementation due to the debtor's obstinacy. This exploration sheds light on its effectiveness as a coercive tool that not only addresses the challenges of recalcitrant debtors but also expedites the resolution of judicial decisions that would otherwise face hindrances in their execution.

1.3 Study Methodology

Through an intricate methodology entrenched in the diligent analysis of legal literature and nuanced legal jurisprudence, this study seeks to attain its objectives. A thorough exploration of comparative laws, with special attention to the complexities of Egyptian civil law, is the key focus of the research. The selected method employs an all-encompassing approach to not only enhance comprehension of legal jargon but

also gain deeper insights into jurisprudential viewpoints. Critical to this is the integration of representative legal opinions, which act as vital stepping stones towards unravelling multifaceted legal principles and their practical implications.

1.4 Study Plan

Within this inquiry, the subject is methodically divided into two disparate categories that intricately dissect the ominous fine system. Both sections serve to examine the dreaded implications from different yet interconnected angles. The maiden section comprehensively unpacks the subtle intricacies and legal nuances that define the menacing fine system. Within these pages, the analysis systematically dissects the foundational theories, conceptual frameworks, and broader legal principles that form and typify the threatening fine within the broader context of the law.

Taking a focused dive into the specific manifestations and applications of the threatening fine within the purview of law, the research seamlessly transitions into its second section. Delving into the intricacies, provisions, and interpretations that encapsulate its implementation and effectiveness, this segment was meticulously designed to provide a comprehensive understanding of the threatening fine system within the legal landscape. By structuring the study in this bifurcated manner, due consideration is given to both its theoretical underpinnings and practical manifestations, aiming for a holistic perspective on the matter.

2 The Legal Nature of the Threatening Fine

Indirectly compelling a non-compliant debtor to honor their contractual obligations, a threatening fine serves as a strategic mechanism. This legal tool intricately involves imposing a specific amount of money on the debtor by a judge, as they show reluctance or refusal to fulfill their commitment within the agreed-upon timeframe and deadline. It should be noted that the fine accumulates proportionately to the duration that the debtor fails to live up to their end of the bargain [1].

Noting the dissimilar legislative stances adopted by Egypt and Jordan, it is interesting to observe their differing integration of the threatening fine system in their respective Civil Laws. Egypt has chosen to incorporate this mechanism, while Jordan has not, as indicated in Civil Law No. 43 of 1976. The contrast in their legislative approaches may be attributed to varying influences from Islamic jurisprudence, further emphasizing the discrepancies in their legal strategies for ensuring debtor compliance in contractual obligations.

2.1 Conditions for Imposing the Threatening Fine

For the imposition of the threatening fine, certain conditions related to the commitment subject must be met:

1. **First Condition**: Sultan notes that in order for a threatening fine to be effective, the commitment must still be feasible for the debtor to carry out [2]. However, it is not permitted to impose a fine for commitments that are impractical to execute, whether caused by external factors or the debtor's inadequacy. Should the incapacity be attributed to the debtor, Badrawi suggests seeking compensation instead [3].
2. **Second Condition**: If the debtor has no personal involvement, the threatening fine cannot be imposed upon them, as the execution of the commitment must depend solely on their presence. When transferring a tangible right, for instance, the debtor is exempt from the fine as long as they are not needed to execute the action. However, if the commitment entails an act or an abstinence from performing an act, and is dependent on the debtor's individual qualities, then the threatening fine can be implemented [3].

It is worth noting that the enforcement of the threatening fine judgment is precluded if there is an infringement upon the personal character of the debtor, particularly in cases where it involves the expression of their intellectual creations. For instance, if an artist commits to sculpting a statue and the artist lacks the necessary inspiration to realize the work, compelling them through the use of a threatening fine would not be permissible.

2.2 Distinguishing the Threatening Fine from Other Systems

The threatening fine differs from compensation, penalty clauses, and legal interest in terms of conditions and objectives.

Distinguishing the Threatening Fine from Compensation

The harm caused by the debtor and the damage suffered by the creditor are taken into account when determining the amount of security a debtor must provide, as detailed in Article 360 of the Civil Law. The same can be found in Article 214 of the Egyptian Civil Law, where tangible execution is possible and refusal of such leads to the court's intervention.

In eviction matters, temporary fines are the only ones acceptable. Otherwise, there is no ban on merging fines and compensation, as their principles differ. Upon payment of fines, creditors can receive compensation for actual harm suffered, but not more than that as affirmed by [4].

Should the debtor persist in their stubbornness and continue to refuse to comply, thereby rendering the warning fine useless, a conversion to final compensation becomes imperative, regardless of whether or not any physical enforcement has

been executed [5]. In order to settle the fine, the creditor may petition the court for a final and enforceable judgment against the debtor's properties as compensation.

Distinguishing the Threatening Fine from Penalty Clauses

In order to establish how much compensation the creditor will receive if the commitment is unfulfilled or delayed by the debtor, a penalty clause is agreed upon ahead of time between the contracting parties. This measure is exclusively in regards to commitments not being met as a result of a contract. You could liken the punitive fine to the penalty clause, in that they are both solely pursued if their commitment is not met by the debtor or is notably delayed. They both provide an indirect way of securing commitment and hold a coercive nature, with the judge left to interpret their value.

While sharing some similarities, there are distinct differences between the threatening fine and the penalty clause. The former is based on the judgment of the judge, whereas the latter is established through agreement between parties. The threatening fine aims to force the debtor to follow through on their commitment, while the penalty clause seeks to make up for damages caused by non-execution or delay. While the threatening fine is assessed each time the commitment is violated, the penalty clause is not evaluated in this manner. Enforceability is not a steadfast concept in regards to fines and penalty clauses. The judgment of the threatening fine is contingent on the resolution of the fine itself, making it a temporary measure. Meanwhile, the penalty clause stands ready for enforcement the moment that it is breached. Only if an overestimation of the penalty clause is proven during execution can it be lessened, whereas the threatening fine is subject to reductions during settlement proceedings. The judge is granted discretion over the review and settlement of the threatening fine. However, the judge's power in relation to the penalty clause is limited by certain regulations that are in place due to its nature as compensation.

Distinguishing the Threatening Fine from Legal Interest

For their failure to fulfill a contractual obligation within a predetermined timeframe or for using a specified sum of money in an agreement with the lender, a debtor is required to pay a financial sum known as legal interest.

The obligation to pay legal interest stems from the debtor's non-payment, as it compensates the creditor for the delay. Proof of damage is not necessary for the creditor to receive interest once the debtor is tardy in payment. The debtor simply needs to meet their commitment by paying the agreed-upon sum by the deadline. Delaying payment is seen as depriving the creditor of potential interest earned had the debt been settled on time [6].

In instances where there are setbacks in fulfilling obligations, both legal interest and a daunting fine require payment in cash rather than any other form of compensation. Despite their similarities, legal interest varies from the imposing fine as court rulings dictate the legal interest rate. Should the agreement regarding legal interest in the contract exist, it cannot exceed the limit designated by the law. On the contrary, when it comes to the verdict of the imposing fine, the court exercises its discretion to either heighten or reduce the fine based on the debtor's position or the extent of procrastination in fulfilling the commitment.

3 Threatening Fine in Law

This section of the study is dedicated to a comprehensive exploration of the execution of judgments incorporating a threatening fine, with a specific focus on the extent to which the legislator has embraced and implemented this particular legal mechanism. The investigation undertaken herein aims to meticulously scrutinize the practical application and utilization of the threatening fine system within the legal framework of. In so doing, an intricate analysis will be conducted to unravel the nuances of how this system is deployed and to what degree it is integrated into the broader spectrum of legal practices. This multifaceted examination will contribute valuable insights into the operational dynamics of judgments involving a threatening fine and shed light on the jurisprudential considerations that underscore the legal landscape in adopting and employing this particular legal instrument.

3.1 Adoption of the Threatening Fine System by the Legislator

In the realm of regulating civil law, Islamic jurisprudence has had an impact on the policies of the legislative body. The role of the threatening fine within the legal system has been particularly influenced. When looking at Islamic jurisprudence, it is worth noting that this code does not explicitly permit the use of a threatening fine, unlike imprisonment. It begs the question: can the threatening fine be deemed illegitimate under Islamic jurisprudence?

To force a debtor who is late to repay their debt, Islamic Sharia permits threatening them. But, before the threat can be put into action, the fine must be changed into an equal amount that represents the damage incurred by the debtor. If the creditor receives any amount higher than what was originally owed, there will be considerations discussed in Islam's legal system [7].

Through the concept of financial coercion, the act of threatening fines can fall under the jurisdiction of usury, making it illegitimate. However, if financial coercion is perceived as a punishment, the notion of usury can be eliminated entirely. According to Islamic Sharia, financial penalties were defined and put into effect through various judgments handed down by the Prophet. For instance, those caught stealing fruits before they fully ripen were punished by imposing a fine amounting to twice the value of the stolen fruit.

Dr. Mohamed Sayyid Al-Tantawi, in contemporary Jurisprudence, issued a fatwa stating that a debtor who delays payments and has the finances to pay back their debt can face monetary penalties or other consequences, including financial penalties that are not considered usury [8]. Additionally, the practice of using financial penalties as a punishment for preventing the payment of Zakat is recognized (Al-Shawkani, p. 123). Dr. Jamal Al-Atifi acknowledges the legitimacy of using imposing punitive

fines as an incentive to fulfill debts, noting that this practice is distinct from usury [9].

The researcher's opinion aligns with jurists who allow threatening fines, distinguishing it from usury in the process.

By exerting pressure on the debtor to adhere to their commitments, the menacing fine may effectively yield results. However, if the debtor stubbornly disregards their obligations, the fine may fail to produce an outcome. Consequently, the judge holds the power to revaluate the verdict and establish the threat's worth in order to dictate the sum that the debtor must compensate.

The debtor's financial capacity should determine the threatening fine's amount, which must be effective on their conscience and impact their known stubbornness and resistance. The judge holds the authority to either lessen or supplement the amount based on any changes in the debtor's level of compliance.

The theory of obligations in civil law lacks a specific clause for the threatening fine. Nonetheless, Article 360 appears to touch on the topic indirectly, highlighting that the definitive guarantee's amount depends on the harm done to the creditor and caused by the debtor, if execution is refused or completed. Notably, this provision comes under the "Execution by way of compensation" banner. Including it in work obligations would be a suitable course of action. The threatening fine is discussed in Article 214 of the Egyptian Civil Code, No. 131 of 1948 and its amendments, which corresponds to Article 360.

Al-Jubouri argues that despite the legislator's failure to explicitly sanction a threatening fine in the theory of obligations, it was indirectly referenced in Article 360 of the Civil Law (2011). Another instance of its explicit mention can be found in Article 961/1 of the same law titled "Self-Guarantee." According to this article, if the guarantor fails to produce the guaranteed party at the appointed time upon request, the court can either impose a threatening fine or excuse the guarantor if they prove their inability to produce the guaranteed party.

Jordanian law is a topic of debate among scholars, with some arguing that the system of the threatening fine is not recognized. They contend that creditor compensation for damages caused by the debtor's failure to meet obligations is justification enough, rendering the imposition of the threatening fine unnecessary [10].

The adoption of the threatening fine by the legislator was not pursued due to the principle of incarceration as a means of enforcement. Nonetheless, a combination of both means of direct enforcement is not completely out of the question. Given that the amended Law No. 9 of 2022 has rendered the effectiveness of imprisonment inadequate, implementing the threatening fine system alongside it would be beneficial. The adoption of the threatening fine system, which has been implemented by various Arab and foreign legislations, is highly recommended since compensation and legal interest judgments do not provide suitable alternatives to the threatening fine due to their incompatibility with the latter's terms and conditions. It is hoped that the legislature will take this guideline into consideration.

3.2 Permissibility of Executing Judgments Issued with a Threatening Fine

The execution of judgments with a threatening fine depends on the final stance of the debtor. If the debtor fulfills the commitment without delay, there is no need for the judgment of a threatening fine. However, if the debtor insists on non-compliance or delays, it is obligatory to enforce the threatening fine, which is quantified as a final amount. The purpose of the threatening fine is to compel the debtor to fulfill the commitment, and, therefore, its valuation is not initially determined. If assessed from the start, it would lose its impact, purpose, and intent.

The threatening fine goes through two stages: the judgment stage and the fine settlement stage. In the judgment stage, it is considered a temporary ruling. In the second stage, the debtor settles the fine, and the amount is not final. It is subject to increase or decrease when determining the final compensation assessed by the judge.

Egyptian courts have ruled with threatening fines. For example, the Urgent Matters Court in Port Said ruled in a case where an individual established a casino on the beach, facing difficulties due to the Suez Canal Company's refusal to supply fresh water, citing its commitment to providing fresh water within the canal cities. The court ordered the company to connect fresh water to the casino within two months from the date of the judgment. If not, the company was obligated to pay a daily financial penalty. The parties agreed that the compensation claim remained pending before the competent judge, and thus, the judgment imposing the fine became enforceable prematurely, based on a non-executable judgment. The debtor was required to first appeal to the court that issued the judgment to obtain a final judgment on the fine or compensation before being able to execute it [11].

If the debtor fails to pay the fine after settlement, coercive enforcement measures are taken. Fine settlement finalizes the debt amount and establishes its existence and the debtor's status of non-compliance. These are conditions for debt execution. Once the threatening fine is settled, the court cannot cancel it, provided that the debtor has breached their commitment after non-compliance and there is no external reason hindering the debtor from fulfilling their commitment.

4 Conclusion

This study has yielded several results and recommendations:

4.1 Results

1. Against the debtor who fails to fulfill their obligations, the judge orders a monetary penalty referred to as a threatening fine. The duration of the commitment execution is also specified, and non-compliance accrues an accumulating fine.
2. The commitment's execution must still be possible and the debtor's personality cannot be violated, as stated in the demanding fine's conditions.
3. Executing the commitment is the ultimate goal of the threatening fine, which distinguishes it from other penalties such as compensation and legal interest. Its purpose is to force the stubborn debtor into compliance.
4. As an adherence to imprisoning the debtor, the legislator has not implemented the intimidating fine, maybe due to some hesitation.
5. Indirect reference to the threatening fine in Article 360 is the only allusion made in the Civil Law regarding this matter, as it is not explicitly mentioned in the theory of obligations.
6. A threatening fine's necessity hinges on the debtor's ultimate position. Paying immediately eliminates the need for a threat. However, if the debtor procrastinates or refuses to comply, settling the fine is mandatory as a final sum.

4.2 Recommendations

1. The inclusion of the fine that poses a threat ought to be made explicit by the legislator in the section regarding work obligations, and not merely under compensation.
2. Similar systems of imposing fines as a threat used by the French and Egyptian legislators should be taken into consideration by lawmakers. This would form one of two important methods for enforcing commitment while maintaining the option of imprisonment.
3. The mere presence of obligations renders compensation and legal interest ineffectual and a threatening fine necessary. In cases where the debtor is a legal entity or refuses imprisonment, a threatening fine is indispensable for ensuring commitment enforcement.

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A Survey on Mobile Malware Detection Using Dynamic Techniques



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Abstract Modern smartphones, with their advanced computing power, face significant security and privacy issues due to third-party applications. Android, as the most popular operating system, is increasingly targeted by hackers. With 4.9 billion people online in 2021 and an expected 7.7 billion smartphone subscriptions by 2028, the proliferation of Android devices has led to a rise in malware. Despite ongoing research and various detection methods, no solution is completely effective. This paper reviews dynamic analysis techniques, including machine learning and deep learning classifiers, for detecting malware during runtime, and also explores static, hybrid, permission-based, and emulation-based detection methods.

Keywords Smartphones · Android mobile devices · Detection techniques · Static detection · Dynamic detection · Machine learning · Deep learning · And malware attacks · Android malware · Classification algorithm · Technological progress

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1 Introduction

The rise in mobile device usage has led to increased security threats, particularly for Android platforms, which are vulnerable to various types of malware, such as viruses, worms, and ransomware in scientific technological progress [1, 2]. Mobile malware, which can steal personal information or damage devices, often originates from third-party apps or sideloaded applications [3]. With the number of smartphone users projected to reach 7.3 billion by 2025 [4], detecting mobile malware is crucial. This paper surveys recent dynamic detection methods, analyzing different malware types, detection processes, and classification algorithms. It also compares existing models based on their accuracy and features, highlighting the limitations and ongoing challenges in Android malware detection. Below is an explanation of the types of Mobile Malware:

Adware: These are types of malware that are bundled with unknown software via pop-up ads or other ways of advertising without user consent [3].

Scareware: Scareware refers to a type of malicious software (malware) that is designed to trick users into taking a specific action, usually for financial gain. The primary goal of scareware is to create a sense of fear, urgency, or panic in the user, prompting them to purchase unnecessary or fake software or services.

Mobile Worm: A worm is a piece of code that can be copied and transferred from one device to another in a computer network without human intervention. Viruses can contain "payloads" that can harm hosts and even inconvenience business owners by using up bandwidth and causing crashes on network servers. In general, data steals user data, deletes data from the system, and creates botnets.

Mobile Botnet: In this various interconnected compromised mobile devices execute tasks and clear their actions based on a C&C server or by passing messages [3].

Mobile Trojans: It is a type of malware that disguises itself as a benign application to trick users into downloading and installing malware is called a Trojan. In this type of malware, attackers gain remote access to steal data and money, extract and modify files, create malware variants, and monitor user's devices (e.g. see screens and engines, etc.). The Trojan that has entered the mobile market is MasterKey, which downloads an APK.

Mobile Spyware: A type of malware that monitors user activities without permission. These activities include collecting sensitive information, scanning, and stealing account information. Spyware interferes with network settings by changing security functions. Spyware attaches itself to real software or Trojans to be exploited. Acallno and FlaxiSpy are known as spyware on smartphones.

Mobile Virus: A virus is a piece of malicious software that can replicate itself and spread throughout the body. They can affect the phone's performance, or worse, expose your sensitive information, allowing hackers to make money.

2 Literature Review

Mobile security research has become a matter of concern. Research on mobile technology is still being conducted in several areas, including design, vulnerability, threats, and detection methods. The security industry is investing billions of dollars in this space. Several of them were studied in this work as foundational ideas. Because there are more and more Android devices, there's a greater risk of security problems caused by malicious software on Android. Many new techniques have been proposed to detect malware. However, mobile malware research is still in its infancy. Researchers have come up with different methods to detect the malware [5].

2.1 Signature-Based Detection

By eliminating the conceptual characteristics, this technique creates a recognizable signature. Malware is characterized as any application whose signature matches the ones that previously existed. Methods for detecting malicious have a selected classification vector connected to a type of detection.

Static Signature-based Detection: This mode uses file signatures for malware patterns and compares the contents of the device's RAM or SD storage to match the pattern.

Behavior Signature-based Detection: In dynamic behavior-based detection, the signature appears after the malicious code is executed in a controlled environment, such as a sandbox or virtualized system. Unlike static analysis, dynamic analysis involves observing the behavior of malware when run in an isolated environment.

Hybrid Signature-based Detection: This technology combines the features of traditional detection tools and behavioral signature-based detection technology to provide more effective detection results when identifying malware. Hybrid detection methods for malware detection include training and detection phases, which can be done with dynamic and static methods according to [6].

2.2 Anomaly-Based Detection

Anomaly-based methods use a less rigorous approach. This is done by observing the behavior of the device from time to time and using the model's indicators as comparison vectors for abnormal behavior.

Static Anomaly-Based Detection: In static anomaly-based detection, characteristics of the file structure of the program are used to identify the malicious program. An

important advantage of static vulnerability detection is that it can detect malware without allowing malware-carrying programs to run on the host.

Dynamic Anomaly Based: Dynamic anomaly-based detection is a sophisticated strategy for detecting malicious behavior, that revolves around monitoring and analyzing the behavior of a system or network in real-time. Unlike traditional signature-based detection methods, which rely on predefined patterns of known threats, dynamic anomaly-based detection focuses on establishing a baseline of normal behavior and then identifying any deviations from that baseline. Kouliaridis et al. [7] introduced Malwarehouse, an innovative open-source tool designed to offer data collection services for studying behavioral patterns in Android malware. To delve into the impact of various malware on the Android platform, the researchers curated a dataset comprising 14 malware samples. Their tool, "MIET," was crafted to extract usage information over time from Android devices for each installed malware.

Hybrid Anomaly-based: Hybrid anomaly-based detection combines static and dynamic anomaly detection to improve the accuracy and efficiency of detecting anomalies on Android devices. In this advanced security strategy, the system not only relies on predefined signatures of known malware but also continuously monitors the behavior of the Android system and applications. By establishing a foundation of normal behavior, the hybrid approach can effectively detect deviations or anomalies that may indicate the presence of malware, even if it's a previously unknown or zero-day threat.

2.3 Specification-Based Detection

Specification-based detection aims to reduce failure risks in anomaly detection by focusing on predefined requirements rather than predicting implementation.

Dynamic Specification-based Detection: Continuously monitors Android app behavior, comparing it to predefined specifications. Deviations from expected behavior are flagged as suspicious.

Static Specification-based Detection: Analyzes the structural properties of executables without execution. Bergeron et al. [8] use static analysis to disassemble binaries, revealing potentially malicious code before execution, thus providing a proactive malware detection approach.

Hybrid Specification-based Detection: It is a new security method that combines the advantages of traditional and robust detection methods to improve the detection and prevention of malicious behavior in Android applications. This hybrid model integrates the benefits of specification-based detection, which relies on predefined rules to evaluate expected behavior, with dynamic analysis which observes the runtime activities of the application.

3 Research Gaps Identified

This article reviews recent research on Android malware detection, focusing on dynamic analysis methods. Although many new models have been proposed, the field remains underdeveloped, with existing studies often neglecting their limitations. The article critically evaluates the strengths and weaknesses of current research, particularly in dynamic motion detection technology. By systematically reviewing studies from 2015 to 2022, it aims to highlight advancements and identify areas for improvement in mobile malware detection on Android.

Source of Data

To find reliable data sources for this research, a meticulous technique was used to gather trustworthy and authoritative data. Reputable academic research databases were emphasized, especially those related to computational sciences and known for their strong publication records. Prominent databases, such as IEEE, Springer, ACM, Wiley, and Inderscience, among others, were thoroughly searched for conference proceedings and journals; these sources were the main sources of data for this research. Notably, sources deemed untrustworthy, such as Wikipedia, were excluded from consideration due to their unreliable rating. On the other hand, information was carefully collected from trustworthy blogs, For example, SAN blog because of its good reputation.

4 Analysis and Discussion

Analysis and Discussion It works by searching for Android-based applications connected to the device, allowing them to keep track of what's going on between them. Dynamic detection technology tracks Android malware in a controlled environment at runtime by identifying malware markers that can be used to model detection signatures [6]. This approach is based on the idea of monitoring the activity of the application while it is running on a physical or virtual machine. While an application is running, software developers can analyze it by monitoring the application's impact on the system, network behavior, API calls, and battery usage. In dynamic analysis, applications often run in a system called a sandbox system or emulator and use an integrated renderer called Monkey that is designed to use human applications [9]. This method uses a software-based CPU emulator to create a controlled environment in which target behavior, including infection, can be analyzed. This new approach involves turning the CPU into a virus-based system [10].

4.1 Based on the Implementation

Detecting malware on Android involves using a variety of tools and methods to collect the dynamically and analyze the behavior of applications in real-time. Table 1 illustrates some common Dynamic tools used in Android malware detection. There are mainly five types of tools that are used to collect the data in a live environment-

Table 1 Comparison of tools

Category	Tool	Advantages/Disadvantages
Emulators and virtual machines	Genymotion	Fast and efficient emulation. Limited support for older Android versions
	Android virtual device (AVD)	Integrated with Android Studio. Resource-intensive, slow startup times
Network analysis	Wireshark	Comprehensive network packet analysis. The steeper learning curve for new users
	Tcpdump	Lightweight and command-line flexibility May not capture data in encrypted connections
Behavioral analysis tools	DroidBox	Open-source, allowing community contributions Limited in providing deep code-level insights
	Mobile-sandbox	Specialized in Android malware analysis Dependency on continuous updates for evolving threats
Dynamic code analysis	Frida	Real-time codeinjection and modification Steeper learning curvedue to advanced features
	Xposed framework	Flexible customization of system behavior Modifying system behavior can lead to instability
Instrumentation frameworks	Dynamic binary instrumentation (DBI) tools	Flexible customization of system behavior Overhead introduced in terms of performance

4.1.1 Classification Algorithm

In this study, we conduct a thorough analysis of machine learning techniques intended for the differentiation between abnormal and typical behavior in Android applications. The main goal is to increase the security of the Android ecosystem. Various machine learning algorithms are used to identify abnormal and normal behavior of Android applications [11]. These algorithms are as follows-

K-Nearest Neighbor

A popular supervised learning technique called k-nearest neighbor (k-NN) can be used for both classification and regression problems. It is a non-parametric method that makes predictions based on the proximity of input data points that resemble (are near) their neighbors in a feature space. The k-NN approach, despite being straightforward, can be very expensive for large files (dataset) because it has to calculate the distance between each new entry and each data entry. Because of its simplicity and intuitiveness, it is still a regularly used algorithm. The main strength of this algorithm is it is Simple and effective for identifying outliers. This algorithm is based on the Supervised Learning technique.

Naïve Based Classifier

It is also a supervised learning algorithm based on Bayes' theorem, used to solve classification problems. It is a probabilistic classifier, meaning it makes predictions based on the probability of objects. Advantages of Naive Bayes Classifier, It is simple, easy to implement, and use. It doesn't need much training data. It has high speed, is not sensitive to irrelevant data, and its algorithm is simple and mature.

Decision Trees

A decision tree is a popular machine-learning technique used for classification and regression. It is a versatile and intuitive model that makes decisions based on a series of questions or conditions. It is a tree-structured classifier where nodes represent features of the dataset, branches represent rules, and each leaf of the node represents a result.

Support Vector Machine (SVM)

It is also known as One-Class SVM. It is a powerful machine learning technique that may be used for regression, linear or non-linear classification, and even outlier detection. It is also a t supervised learning algorithm that creates a boundary around normal instances during training. Instances falling outside this boundary during testing are classified as anomalies. The main purpose of the SVM algorithm is to find the best hyperplane in N-dimensional space that can separate different groups of data points in a given space. The main advantage of SVM is its high accuracy, and speed, and it also deals with high dimensional, non-linear problems. The main drawbacks of this method are the high load, the need to select the physical devices correctly, and the need for repeated calls.

Random forest

This algorithm is also a supervised learning method and can be used in both classification and regression problems in machine learning. Random Forests build multiple decision trees and classify instances based on the majority vote. Anomalies can be identified by assessing disagreements among the trees. It is a classifier that has multiple decision trees for various subsets of a given dataset and are averaged to improve the prediction accuracy of the dataset. The main strength of this algorithm is, that it is robust and capable of handling large datasets with high dimensionality [12].

Convolution Neural Networks

Researchers use advanced neural network models such as convolutional neural networks (CNN) and Recurrent neural networks (RNN), to detect malware in Android apps. These neural networks are inspired by the human twain and are good at recognizing complex patterns and relationships within the characteristics of different applications. By leveraging these deep learning techniques, researchers aim to identify and distinguish between malicious and benign Android software. These are some common machine-learning algorithms used by researchers to detect Android malware.

4.2 Based on the Evaluation Matrix

When using machine learning for Android anomaly detection, it is necessary to preprocess and prioritize data, select features carefully, and evaluate the performance of the selection process based on the characteristics of the data list. Measuring the performance of a machine-learning model is one of the most important steps in building a good machine-learning model. The model must meet certain requirements and measures for performance evaluation [3, 13]. Different indicators called performance evaluation matrices are used to evaluate the effectiveness or quality of the model. These performance metrics help us understand how well our model performs on specific data. In this way, we can improve the performance of the model by adjusting the hyperparameters. Different metrics are used to evaluate the effectiveness of the classification model; some of these are:

4.2.1 Confusion Matrix

A table called a confusion matrix is used to assess how well a classification algorithm performs when applied to a collection of test data that has known true values. It is particularly useful for assessing the accuracy and reliability of a model's predictions by providing a detailed breakdown of the model's performance on different classes. It is easy to use, but the terms used in this matrix can be confusing for beginners.

Fig. 1 Confusion matrix

	Predicted Positive (P)	Predicted Negative(N)
	True positive (TP)	false negative (FN)
	False positive (FP)	true negative (TN)

See Figure 1 for an explanation of the terms used in the matrix. A Confusion Matrix consists of four main components:

True Positive (TP)

It is an instance where the model correctly predicts the positive class. For example, correctly identifying actual instances of a disease.

True Negative (TN)

It is an instance where the model accurately predicts the negative class. For example, correctly identifying instances as not having a disease.

False Positive (FP)

It is an instance where the model fails to predict a positive class correctly. Also called a Type I error. For example, incorrectly identifying instances as having a disease when they do not.

False Negative (FN)

It is an instance where the model wrongly predicts the negative class. Also called a Type II error. For example, incorrectly identifying instances as not having a disease when they do.

4.2.2 Accuracy

Accuracy is the highest measure of performance; it is simply the ratio of correct observations to all observations.

$$\text{Accuracy} = \frac{TP + TN + FP + FN}{TP + TN}$$

4.2.3 Precision

Precision measurement is used to overcome accuracy limitations. Precision is a good measure for making decisions when the cost of a False positive is high.

$$\text{Precision} = \frac{TP}{TP + FP}$$

4.2.4 Recall

Its purpose is to calculate the proportion of unidentified true positives. A true positive or a prediction that matches all positive outcomes can be thought of as a correct prediction as a positive or an incorrect prediction as a negative (true positive and negative).

$$\text{Recall} = \frac{TP}{TP + FN}$$

4.2.5 F1 Measure

The Fl measure balances precision and recall. This is important when you need to reduce the false positives and false negatives.

$$\text{F1 score} = \frac{2 * Precision * Recall}{Precision + Recall}$$

Most of the models we analyzed for this study were using Specificity as an important factor to evaluate the model. In Figure 2 Accuracy, precision, recall, Fl measure, and specificity in percent are displayed in a pie chart. In the model we reviewed 219 % were using specificity for evaluating the model, 19.7% were using accuracy,19% Precision, 20% recall, and 19.5% Fl—Measures. Some of the authors haven't specified the accuracy or have given some other metrics that are difficult to approximate.

4.3 Based on Accuracy

Accuracy is a critical factor in evaluating the performance of any machine-learning model, including those designed for Android malware detection. It tells how many benign apps are correctly identified as benign. When we collect the data, it typically consists of both benign (non-malicious) and malicious samples [14, 15]. The goal is to correctly identify and classify whether an app is malicious or not that is why most of the model's performance is evaluated based on the accuracy of the model. Accuracy refers to the proportion of samples correctly identified out of the total sample. The formula for accuracy is:

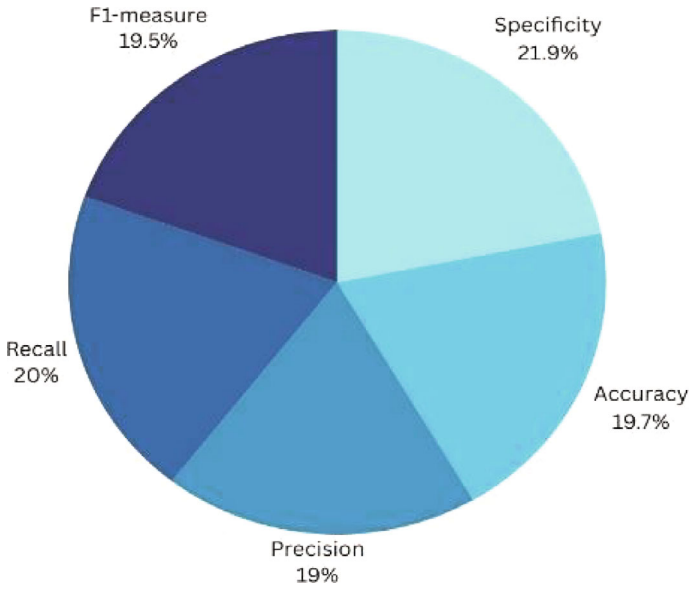


Fig. 2 Android malware detection evaluation matrix

$$\text{Accuracy} = \frac{\textit{Number of Correctly Samples}}{\textit{Total Number of Samples}}$$

In Table 2, the accuracy of algorithms, we have shown in a tabular form, the algorithms we reviewed are mostly of 91–100% accuracy, and 18% of authors haven't specified the accuracy or have given some other metrics that are difficult to approximate. 20% papers we reviewed have 80–90% accuracy these are from the early years of paper publication. And a total of 20% with accuracy between 71 and 90%. The data shows us that mobile malware detection techniques have been doing pretty well in recent years [16, 17].

Table 2 Comparison based on accuracy

Accuracy (%)	Reference number
70–85	12–15
86–90	16–20
91–95	21–28
96–100	29–37

5 Conclusion:

Malware detection and classification is challenging due to the use of obfuscation methods by applications. This paper reviews 13 years of research (2010–2023) on dynamic analysis techniques for malware detection on Android, focusing on machine learning and deep learning approaches. We evaluated current models for their performance and accuracy in detecting both known and emerging malware. Despite recent improvements, current techniques struggle with zero-day malware. Future work will include reviewing advancements in malware detection for Android and macOS.

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An Essay on Enhancing KYC Efficiency Through Distributed Ledger Technology and Decentralized Finance



Joan Merin Saji, K. P. Jaheer Mukthar, and Hayel Khafajeh

Abstract This article investigates the substantial burden that the existing Know-Your-Customer (KYC) process places on financial institutions (FIs) and their consumers. Repeated verification among organizations causes delays, expensive expenses, and inefficiencies. The potential to transform KYC through Distributed Ledger Technology (DLT) and Decentralized Finance (DeFi) is examined in this essay. Every user can have a single, verified KYC record produced by utilizing the transparent and safe characteristics of DLT. It conforms to a record that can be safely shared with approved financial institutions, removing the need for duplicate verification and expediting the onboarding process. Self-sovereign identification is one of the DeFi concepts that might give users more control over their data, thus improving security and privacy.

Keywords Distributed ledger technology (DLT) · Decentralized finance (DeFi) · Cryptography · Blockchain · Smart contracts

1 Introduction

The banking sector is grappling with a significant challenge in the form of escalating regulatory costs associated with the know-your-customer (KYC) verification process. According to a recent survey by Thompson Reuters (2016), financial institutions face

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an average yearly direct cost of USD 60 million to fulfill their KYC obligations. This financial burden is further compounded by penalties imposed on institutions for violations related to anti-money-laundering (AML) and KYC regulations. The Head of Strategy and Risk at the Hong Kong Securities and Futures Commission highlights KYC and AML as prominent inefficiencies, noting that these issues can accumulate fines exceeding 10 billion US dollars for banks (Benedict et al. 2016). Additionally, financial institutions are prohibited from engaging in business with corporate entities until the full KYC process is completed. Given that this process is time-consuming and its duration increases with the size of the corporate entity, it leads to delays in initiating business relationships, incurring opportunity costs for both parties. The survey reveals that 89% of customers face challenges and dissatisfaction with their KYC experiences.

Distributed Ledger Technology (DLT) plays a crucial role in the functioning and development of Decentralized Finance (DeFi). Let's explore the relationship between DLT and DeFi. DeFi relies on DLT, commonly implemented through blockchain technology, as its foundational infrastructure. Blockchain ensures transparency, immutability, and security of financial transactions. DLT enables the creation and execution of smart contracts, self-executing agreements with coded rules. Smart contracts form the basis for many DeFi protocols, automating various financial processes without the need for intermediaries. DLT enables the removal of intermediaries, fostering a decentralized environment where users have direct control over their assets and financial interactions. This aligns with the core principles of DeFi. DLT facilitates the tokenization of diverse assets, encompassing both digital and real-world assets. Tokens can be effortlessly transacted on the blockchain, supporting the development of varied financial instruments within the DeFi ecosystem. DLT ensures that once data is recorded on the blockchain, it becomes tamper-resistant and immune to alterations. This transparency and immutability enhance the credibility of financial transactions in DeFi. DLT employs cryptographic techniques and consensus mechanisms to secure transactions, a critical aspect in DeFi where users depend on the system's integrity to protect their assets.

DLT enables interoperability solutions, facilitating the smooth movement of assets and data across different blockchains. This interoperability aids the integration of various DeFi platforms. The permissionless nature of DLT allows developers to innovate and contribute to the DeFi ecosystem without requiring approval, fostering continual growth and evolution. DLT further provides global access to financial services, promoting financial inclusion by allowing users worldwide to participate in DeFi activities without geographical limitations.

DLT can be employed for decentralized identity solutions, enhancing the security and privacy of user information within the DeFi space. Particularly when combined with smart contracts, DLT enables trustless transactions, allowing users to engage in financial agreements without the need for trust in a central authority. The programmability of DLT, especially through smart contracts, facilitates the creation of intricate financial instruments, decentralized applications (DApps), and automated financial logic within the DeFi domain.

Many DeFi platforms, protocols, and projects make use of Distributed Ledger Technology (DLT). Instances include lending platforms like Compound and Aave, decentralized exchanges such as Uniswap and SushiSwap, and decentralized oracles like Chainlink. To sum up, DLT acts as the technological bedrock that enables the principles and functionalities of Decentralized Finance. It supports the trustless, transparent, and decentralized characteristics of DeFi, enabling the development of inventive financial solutions and promoting global financial inclusion.

2 The Integration of DLT in KYC

Immutable Record Keeping:

Distributed Ledger Technology (DLT), particularly blockchain, guarantees the creation of a singular and unchangeable repository for Know Your Customer (KYC) information through its inherent features and processes. The following outlines how DLT accomplishes this:

In a DLT system, information is not stored centrally but is distributed across a network of nodes (computers), with each node possessing a complete ledger copy. This decentralized structure eliminates a single point of control or failure, mitigating the risks associated with data manipulation or unauthorized modifications. DLT relies on a consensus mechanism, requiring nodes to agree on transaction validity before adding them to the ledger. Prior to recording any KYC data, nodes reach a consensus on its accuracy and validity, adding an additional layer of security and data integrity. KYC details are stored in blocks, and each block includes a cryptographic hash of the preceding block, forming a blockchain.

Attempting to alter data in a block necessitates changing all subsequent blocks, a computationally impractical task. The cryptographic linkage guarantees the immutability of each block and the entire record. KYC data undergoes transformation into a fixed-size string of characters using cryptographic hash functions. Even a minor change in the input data results in a distinct hash, serving as a unique identifier for the data and allowing immediate detection of any alterations. Each block in the blockchain is timestamped, indicating the precise time of its addition to the ledger. The chronological order of blocks enhances security, as once information is recorded in a block, it is time-stamped and cannot be retroactively altered without modifying the entire subsequent history.

DLT platforms often integrate smart contracts to encode and execute business rules related to KYC processes. Smart contracts, once deployed, are immutable, ensuring predefined rules for KYC information recording and management that cannot be altered after deployment. This guarantees consistency and adherence to regulatory requirements. DLT permits permissioned access, granting specific entities the ability to read or write information. KYC information is secure, with access limited to authorized parties, enhancing privacy and minimizing the risk of unauthorized modifications.

In conclusion, the amalgamation of decentralization, consensus mechanisms, cryptographic techniques, time-stamping, and smart contracts within DLT ensures the creation of a singular, unalterable record for KYC information. This not only offers a high level of security and integrity but also nurtures trust among parties relying on the precision of KYC data.

3 Interoperability and Information Sharing

Distributed Ledger Technology (DLT), notably blockchain, plays a pivotal role in promoting interoperability among institutions through the establishment of a standardized and decentralized framework for data sharing and communication. DLT platforms commonly integrate standardized protocols and specifications, allowing institutions adhering to the same standards to effortlessly communicate and share data. Smart contracts on DLT enable self-executing agreements based on predefined rules, and implementing standardized smart contracts fosters consistency and compatibility in data interactions, promoting interoperability.

Consensus mechanisms in DLT validate transactions and maintain a shared, consistent ledger across multiple nodes, ensuring synchronized and agreed-upon data views among participating institutions. This reduces discrepancies and enhances interoperability. DLT also supports decentralized identity solutions, enabling entities to establish and verify identities across different systems, crucial for seamless and secure identification processes, thereby enhancing interoperability.

Cross-chain technologies enable the transfer of assets and data between different blockchain networks, expanding the scope of interoperability beyond a single blockchain. Common token standards, such as ERC-20 and ERC-721, define how tokens are created, transferred, and managed on DLT platforms. Institutions adhering to these standards can seamlessly interact with each other's tokens, facilitating interoperability in the exchange of value.

Decentralized Applications (DApps) built on DLT platforms offer programmable interfaces and functionalities, allowing institutions to integrate shared applications into their systems, promoting interoperability through decentralized infrastructure. Oracles act as bridges between smart contracts on DLT and external data sources, facilitating interoperability by incorporating real-world data into decentralized applications.

DLT-based Application Programming Interfaces (APIs) provide standardized interfaces for data access and communication, allowing institutions to integrate their systems with DLT platforms and enabling seamless information exchange. Consortia, comprising groups of collaborating institutions on shared DLT networks, enhance interoperability among consortium members. Participation in interconnected consortia enables institutions to transact and share data with predefined standards and rules, fostering interoperability.

DLT's global accessibility allows institutions worldwide to engage in interoperable transactions, transcending geographical borders and regulatory boundaries. This

results in streamlined processes, reduced friction in data sharing, lower costs associated with reconciliation and manual interventions, and collaborative development of new solutions and services through shared infrastructure. Additionally, DLT ensures enhanced security and data integrity through decentralized consensus mechanisms. DLT serves as a foundational technology promoting interoperability among institutions by providing standardized protocols, smart contracts, decentralized identity solutions, cross-chain technologies, and other mechanisms that facilitate seamless communication and data sharing across diverse systems and platforms. This interoperability is fundamental to creating a more connected and efficient global financial ecosystem.

4 Smart Contracts for Automated Verification

Smart contracts play a crucial role in automating and enhancing Know Your Customer (KYC) compliance processes. They streamline procedures, boost efficiency, and ensure strict adherence to regulatory requirements. By programming smart contracts to automatically verify KYC information against predefined rules and criteria, manual intervention is reduced, expediting the KYC process with heightened accuracy and consistency in compliance checks.

KYC compliance involves specific rules and criteria established by regulatory bodies or institutions. Smart contracts encode these rules into programmable logic, allowing for automated and standardized compliance checks based on the defined criteria. Continuous monitoring and verification of KYC information are essential due to potential updates, and smart contracts can be designed to trigger real-time updates and re-verification processes whenever user information changes, maintaining current compliance checks.

To ensure secure handling of KYC data, smart contracts employ cryptographic techniques and operate within secure execution environments. This security feature prevents unauthorized access and manipulation of sensitive KYC information, bolstering data integrity and protection. The results of KYC compliance checks are recorded on the blockchain in an immutable and tamper-resistant manner by smart contracts. This ensures a transparent and auditable record of compliance activities, offering a verifiable history for regulatory purposes.

Implementing selective disclosure mechanisms, smart contracts allow users to control the information they share for KYC purposes, aligning with principles of decentralized control and user privacy. Automation through smart contracts significantly reduces the time and resources required for manual KYC compliance checks, leading to increased operational efficiency and cost savings for institutions.

Smart contracts also facilitate interoperability and collaboration between institutions for KYC purposes. Institutions can share programmable KYC compliance checks through smart contracts, fostering a standardized and interconnected compliance ecosystem. Based on KYC compliance status, smart contracts can conditionally grant or restrict access to certain services or execute specific transactions, ensuring

that only users meeting necessary compliance criteria can access financial services or engage in transactions.

Incorporating time-stamping mechanisms, smart contracts record when specific smart contracts interact with external oracles to fetch real-world data for KYC verification, ensuring access to up-to-date information and enhancing the accuracy of compliance checks. Additionally, smart contracts can trigger notifications and alerts to users for any KYC-related actions, such as upcoming renewals or required updates, contributing to a more user-centric KYC experience.

Smart contracts play a foundational role in transforming KYC procedures by executing rule-based logic, ensuring secure data handling, maintaining immutable records, and enabling efficient, programmable processes. Their impact is substantial in making KYC processes more efficient, transparent, and aligned with decentralized control and privacy principles.

5 Decentralized Finance in KYC

Decentralized Finance (DeFi) distinguishes itself through the fundamental principle of permissionless access, empowering individuals worldwide to engage in financial services without the reliance on traditional gatekeepers. Operating on decentralized blockchain platforms, DeFi eliminates the necessity for central authorities or intermediaries such as banks or financial institutions. Users can directly interact with DeFi protocols, securing permissionless access to financial services without requiring approval or intermediation. DeFi protocols are open-source, allowing anyone to access and review their code. This openness cultivates an inclusive ecosystem where individuals globally can not only use but also contribute to DeFi applications, promoting financial access on a global scale. Decentralized Exchanges (DEXs), prevalent in the DeFi space, facilitate peer-to-peer trading without central authority oversight. Participants can trade directly, removing barriers and enabling permissionless access to trading markets.

DeFi lending platforms facilitate direct lending or borrowing of assets through smart contracts, eliminating the need for traditional banking institutions. Stablecoins within DeFi provide a stable value pegged to fiat currencies, allowing users to transact without requiring a bank account, thus offering permissionless access to a stable store of value and a medium of exchange. Decentralized Autonomous Organizations (DAOs) govern and manage various DeFi protocols, enabling token holders to participate in decision-making, contributing to the decentralized and permissionless nature of these processes. Geographical restrictions are eliminated in DeFi, allowing users to engage in cross-border transactions without traditional banking limitations. This global accessibility fosters financial inclusion across borders. DeFi further facilitates the tokenization of diverse assets, including real estate and commodities, breaking down traditional barriers to entry and providing permissionless access to investment opportunities.

Insurance and derivative products within DeFi operate without central insurance providers. Users can hedge risks and insure assets in a decentralized manner, granting permissionless access to risk management tools. DeFi explores decentralized identity solutions, empowering users to control and manage their identity without reliance on centralized authorities. This ensures access to financial services while maintaining control over identity information, contributing to privacy and permissionless access.

DeFi platforms utilize smart contracts to automate financial processes, enabling users to programmatically interact with financial services without intermediaries, ensuring permissionless execution of financial agreements. By providing financial services to the unbanked and underbanked, DeFi democratizes finance, fostering financial empowerment and inclusion for individuals who traditionally lacked access.

DeFi's emphasis on permissionless access revolutionizes the traditional financial landscape, removing barriers, enabling global participation, and offering a decentralized and inclusive alternative to traditional financial systems. This paradigm shift aligns with the principles of financial openness, accessibility, and empowerment.

6 Decentralized Identity Solutions

The evolution of decentralized identity solutions in the decentralized finance (DeFi) space is prompted by the necessity for user-centric, secure, and privacy-preserving identity management. These solutions aim to grant individuals greater control over their personal information while promoting interoperability across diverse DeFi platforms. Self-Sovereign Identity (SSI) is a foundational concept in decentralized identity solutions, emphasizing the ownership and control individuals have over their identities. DeFi platforms are exploring SSI principles to empower users in managing their identity information, including KYC details, credentials, and attestations, in a self-sovereign manner.

Decentralized Identifiers (DIDs) constitute identifiers created, owned, and controlled by the subject of the identifier. DeFi projects are incorporating DIDs to establish unique and decentralized identifiers for users, ensuring secure and privacy-enhanced identity representation on the blockchain. Verifiable credentials, tamper-evident digital credentials, are integrated into DeFi platforms to enable users to share specific identity attributes or credentials with third parties without revealing unnecessary information, contributing to more efficient and secure KYC processes. Decentralized identity wallets securely store and manage users' digital identities and credentials in a secure and user-friendly manner.

The integration of decentralized identity wallets within DeFi projects empowers users to control access to their financial services and assets using their identities stored in these wallets. Interoperability protocols facilitate seamless communication between different decentralized identity systems, with DeFi platforms adopting standards such as the Decentralized Identity Foundation's (DIF) Interoperability Working Group's recommendations for cohesive functionality across various DeFi applications. Zero-knowledge proofs allow users to prove the authenticity of certain

information without revealing the details. DeFi platforms leverage zero-knowledge proofs to enhance privacy in identity verification processes, ensuring that only necessary information is disclosed during transactions. Some DeFi projects are exploring the creation of identity registries on the blockchain, where user identities are stored and managed in a decentralized manner.

Blockchain-based identity registries provide a transparent and immutable record of identities, enhancing the overall integrity of decentralized identity solutions. These solutions are being integrated with widely adopted authentication standards, with DeFi platforms exploring the use of standards like OAuth and OpenID Connect to facilitate secure and standardized authentication processes within decentralized identity frameworks. Governance models are being implemented to enable community-driven decision-making in decentralized identity systems. DeFi projects recognize the importance of community governance in managing identity solutions, ensuring that the interests and needs of users are considered in the evolution of these systems.

Some decentralized identity solutions within DeFi incorporate features to comply with regulatory requirements, particularly in KYC and AML (Anti-Money Laundering) processes. Solutions that balance regulatory compliance with user privacy are actively explored to create a harmonious environment within the evolving regulatory landscape. Decentralized Autonomous Organizations (DAOs) are integrating decentralized identity solutions for members. DAOs are exploring identity solutions to manage membership, voting rights, and participation, enhancing the transparency and inclusivity of decision-making processes. There is a growing emphasis on educating users about the benefits and security practices associated with decentralized identity. DeFi projects are investing in educational initiatives to empower users with the knowledge and skills needed to manage their decentralized identities effectively.

Ensuring that decentralized identity solutions are user-friendly is crucial for widespread adoption. Achieving interoperability requires the development and adoption of standardized protocols. Balancing regulatory requirements while preserving user privacy is a complex challenge that requires careful consideration. The development of decentralized identity solutions in the DeFi space is marked by a commitment to user empowerment, privacy, and interoperability. As these solutions continue to evolve, they contribute to creating a more secure, user-centric, and inclusive financial ecosystem within the decentralized finance landscape.

7 Reduced Data Redundancy

Decentralized Finance (DeFi) platforms utilize advanced technologies to mitigate data redundancy in Know Your Customer (KYC) processes. Conventional KYC procedures often involve repetitive data submissions for different financial services, introducing redundancy and potential security vulnerabilities. DeFi platforms embrace self-sovereign identity principles, empowering users to own and control their identity data. This user-centric approach eliminates the necessity for

redundant data submissions across various financial services, as users can selectively share specific information, thereby minimizing redundancy.

Distributed Identifiers (DIDs) are employed by DeFi platforms to create unique identifiers for users, and verifiable credentials are utilized to attest to various identity attributes. Users can present verifiable credentials instead of redundant sets of personal information, selectively sharing them based on the specific requirements of each DeFi service, thus reducing redundant data exposure. Smart contracts play a crucial role in automating KYC compliance checks and maintaining an immutable record of user verification. Once a user's KYC data is verified through a smart contract, the verification status can be referenced across different DeFi services without redundant verifications.

DeFi platforms enable users to selectively disclose specific identity attributes as needed, avoiding redundant disclosure of information by sharing only the necessary attributes required for each financial service. This approach enhances privacy and minimizes the exposure of sensitive data. Zero-knowledge proofs add an additional layer of privacy by allowing users to prove the authenticity of certain information without revealing the actual data. Through zero-knowledge proofs, DeFi platforms can verify the accuracy of user data without requiring the user to redundantly disclose the raw information, reducing data redundancy.

Adhering to interoperability standards, DeFi platforms facilitate seamless communication and data sharing between different services. When users transition between DeFi platforms that follow interoperable standards, their KYC status and relevant information can be recognized without the need for redundant submissions. Users manage their identity information in decentralized identity wallets, providing a centralized location for storing and managing KYC data, eliminating the need for redundant submissions across multiple platforms.

KYC verification results are securely stored on a blockchain, ensuring an immutable and tamper-resistant record. Once a user completes KYC verification on a DeFi platform, the result is recorded on the blockchain, reducing the need for repetitive verifications on other platforms. DeFi projects collaborate to establish shared identity standards and cross-platform identity solutions. When different DeFi platforms adhere to common identity standards, users experience reduced redundancy in KYC processes, as their verified identity can be universally recognized.

Collaboration within a decentralized finance consortium ensures shared KYC standards. This approach streamlines KYC data verification, adhering to common standards and reducing the necessity for users to undergo redundant KYC processes across different consortium members. Achieving interoperability between diverse DeFi platforms necessitates common standards and protocols. Balancing compliance with varying regulatory requirements while minimizing data redundancy presents a complex challenge.

Educating users about the benefits of decentralized identity and selective information disclosure is paramount. DeFi platforms address data redundancy in KYC processes by empowering users with self-sovereign identity, leveraging decentralized identifiers and verifiable credentials, employing smart contracts, enabling selective information disclosure, and promoting interoperability. These comprehensive

approaches contribute to a more efficient, secure, and user-friendly KYC experience within the decentralized finance ecosystem.

8 Current KYC Process

The KYC initiation process occurs when a customer expresses the intent to engage with a financial institution. Sequentially, an agreement on relationship terms is reached between the customer and the financial institution. Subsequently, the customer submits necessary documents to the financial institution to facilitate the KYC verification process. The financial institution examines the documents and generates an internal certification document, assuring regulators that the customer has been validated or rejected, and the KYC process has been correctly conducted. This cycle repeats whenever the customer seeks to collaborate with a new financial institution.

In the current scenario, each time a customer initiates a relationship with a financial institution, the costs associated with the KYC verification process reoccur. Figure 1 illustrates a scenario where a customer intends to engage with three distinct financial institutions, demonstrating how, for this individual customer, document exchange and the core KYC validation must be repeated three times, resulting in costs three times those of a single KYC process. It is essential to differentiate between the "core KYC verification process," mandatory for all financial institutions by law, and additional, institution-specific procedures. While each financial institution may request additional documentation to create an "additional aura of information" for each customer, our focus is exclusively on the shared core KYC verification process among all financial institutions in a jurisdiction.

The evolution of regulations, technological advancements, and the 2007 financial crisis have given rise to opportunities in the "regtech" field, aimed at leveraging

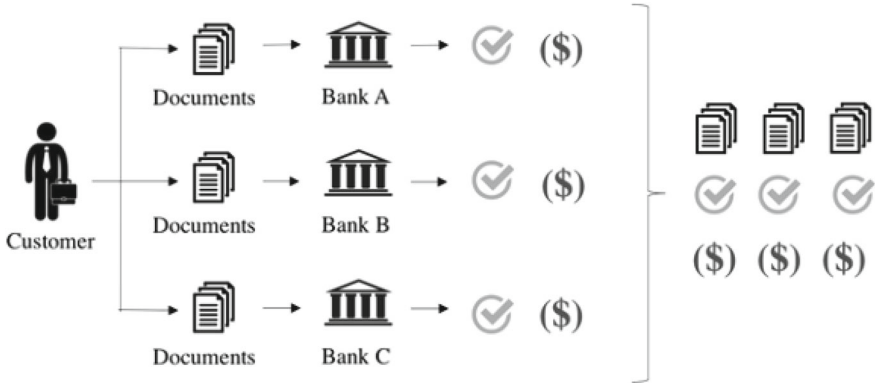


Fig. 1 Moyano [8] current structure and cost of KYC

technology to enhance regulatory implementation. "Regtech" combines "regulation" and "technology." Opportunities within KYC have gained prominence (see Memminger et al. 2016; Arner et al. 2016). Arasa and Ottichilo (2015) analyze KYC costs based on compliance complexity for commercial banks in Kenya, identifying four variables explaining 78.3% of compliance requirements. Soni and Duggal (2014) explore the use of big data analytics to mitigate risks in institutions conducting KYC. Colladon and Remondi (2017) employ cluster analysis to identify suspicious financial operations and potential criminal activities, enhancing KYC through relational data mapping and predictive models.

The current paper aims to contribute an additional improvement by employing Distributed Ledger Technology (DLT) to reduce the overall cost of the KYC process.

9 Blockchain Technology

DLT, exemplified by blockchain technology, has gained prominence largely due to the widespread adoption of the cryptocurrency Bitcoin. Introduced by Nakamoto in 2008, Bitcoin marked the first functional cryptocurrency not under the control of a central authority. Initially devised for creating and transferring money via the Internet, DLT has evolved to govern decentralized systems through the implementation of smart contracts. Smart contracts, as defined by Szabo in 1997, are computer protocols designed to facilitate, verify, or enforce predefined clauses when specific conditions are met. The primary aim of using smart contracts, as Szabo elaborates, is to embed them in various valuable properties controlled through digital means.

Following Nakamoto's groundbreaking work, new instances proposing DLT for diverse purposes have emerged. Notable among them is "Ethereum," a platform capable of running entire decentralized applications, as detailed by Wood in 2016. Numerous papers, including those by Peters and Panayi (2015) and Harvey (2016), delve into the blockchain's technical aspects.

While Bitcoin's blockchain transactions incorporate small scripts defining output spending conditions, Ethereum's blockchain can be considered a Turing complete virtual machine capable of running code in multiple programming languages, thus executing the smart contracts stored within it (see Glaser 2017). Glaser's ontological development of blockchain systems concepts provides a robust framework for assessing the implications of blockchain solutions in academic or economic contexts. The analysis introduces the perspective of pervasive decentralization across multiple layers of digital infrastructure through blockchain technology.

Glaser (2017) defines two layers of code: the fabric layer and the application layer. The fabric layer encompasses the system's code base, covering communication, public-key infrastructure, database construction and maintenance software, and the system's execution environment. The governance type of the system is ultimately defined by the fabric layer, which can be public, permissioned, or hybrid. A crucial characteristic of blockchain systems, as highlighted by Glaser, is the absence of differentiation between users and user management modules, providing complete

transparency to all users when reading transactions and deployed smart contract code.

The application layer involves the application logic of services implemented in the form of smart contracts and comprises three dimensions: ecosystem closedness, value linking, and market type. Ecosystem closedness gauges the extent to which the system interacts with structures outside the blockchain-based framework. The more closed the system, the higher the leverage of a blockchain-based solution due to decentralization ending at the blockchain system's boundaries. Value linking refers to the intrinsic value of tokens exchanged within the system, with four potential ways of assigning value, as proposed by Glaser: community currency, debt or equity as perceived by participants, backed by a commercial bank, or backed by a central bank. The market type, the final dimension, delineates the nature of the market in which the blockchain-based solution operates.

The European Security and Markets Authority (2016) outline the potential benefits of DLT in securities markets, explore challenges and shortcomings, and analyze the regulatory framework relevant to DLT applications in securities markets, focusing on primary EU legislation.

The regulatory framework for DLT solutions outlined by the Authority, primarily focusing on the securities market, bears striking similarities to the governance framework proposed in this paper. Specifically, the Authority suggests that, for the interbank context within securities markets, a permission-based system could be highly beneficial. The suggested system aims to govern the interactions among participants, with a particular emphasis on delineating the responsibilities of each participant, implementing correction mechanisms, and defining penalties in cases of rule infringement.

In a complementary vein, the European Central Bank (2012) provides a classification of virtual currency schemes based on observed characteristics. These schemes are categorized into three types: Type 1, representing closed virtual currency schemes akin to those used in online gaming; Type 2, denoting virtual currency schemes with a unidirectional flow, typically involving a conversion rate for acquiring the virtual currency; and Type 3, indicating virtual currency schemes with bidirectional flows.

Examining disruptive innovations in the financial sector, the World Economic Forum (2016) delves into the impact of DLT on reshaping financial services and the role of financial institutions in constructing digital identity. The Forum's analysis suggests that DLT has the potential to design new systems or enhance existing ones by automating processes, reducing settlement times, cutting costs, minimizing operational risks, disintermediating central authorities, and facilitating real-time settlements. In a related study, Egelund-Müller et al. (2017) explore the development of an automated financial system, involving multiple counterparties, capable of executing various complex financial derivatives, including settlement, directly on DLT (Fig. 2).

The revised system allows the same customer to engage with three different financial institutions, yet the exchange of documents and the core KYC verification process now takes place only once, resulting in a reduction of costs to a third. This system adheres to the previously established conditions: proportionality, irrelevance, privacy, and no minting.

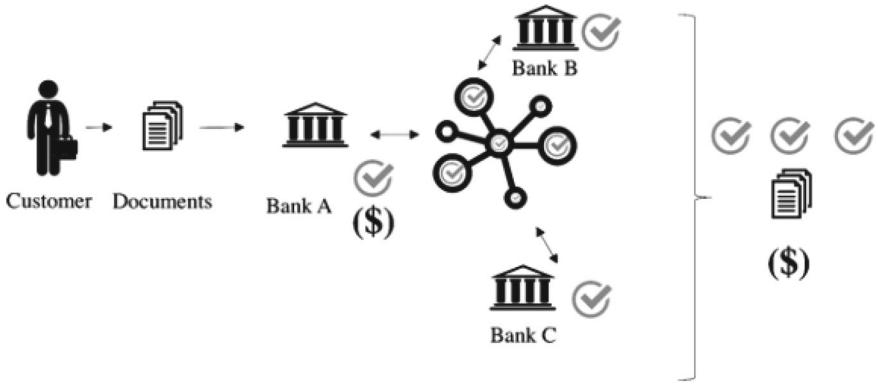


Fig. 2 Moyano [8] current KYC process through decentralized finance

Concerning privacy, as each financial institution employs a single account for each customer, making it impossible to identify which institution corresponds to a specific public key, privacy is assured for both customers and financial institutions. Only in the scenario where a customer interacts with all institutions within the system could those institutions deduce this occurrence. However, given that financial institutions utilize only one account per customer, their privacy remains safeguarded in relation to other customers. The no-minting condition is satisfied, as the addition of an institution to a customer's onboarding list can only occur through a legitimate payment made by the institution. Since the compensation for the core KYC verification process is triggered solely by a genuine customer approaching an institution, there is no incentive for any institution to fabricate smart contracts falsely claiming the completion of a core KYC verification process. In such a fabricated scenario, no actual customer would exist behind the process, subsequently approaching another institution for verification.

10 Implementing the Redefined KYC Solution

In this section, we delve into the considerations surrounding the implementation of the DLT-based KYC solution outlined earlier. It is crucial to emphasize that deploying such a system would carry substantial ramifications for the financial sector, necessitating close collaboration with regulatory authorities. Additionally, the various facets of the system's implementation would be contingent on specific national guidelines and legislative frameworks. Therefore, this section explores not only the proposed system but also two alternative variations that introduce varying levels of centralization, enabling feasible implementation. We also scrutinize alternative design approaches, examining both the challenges and advantages associated with these alternatives.

11 Design of a KYC Solution

In the initial phase, the customer initiates the KYC process by approaching their home bank and submitting the requisite documents for verification. The home bank, utilizing the system's application installed at each participating bank, manages the document exchange process with the customer externally from the distributed ledger and stores these documents within its local database. As the home bank processes each document, the hash of the document is recorded on the distributed ledger. Upon successful validation of the customer, the home bank can compile the comprehensive document package. This package includes all previously hashed documents used for verification, along with the digitally signed document endorsing the customer's verification status. Subsequently, the customer has the ability to grant access to this document package to any other institution they plan to engage with. Consequently, the subsequent institution requiring KYC validation for this customer can leverage its local client application to interact with the customer's smart contract. This interaction facilitates obtaining the customer's status, registering itself in the onboarding institutions list, and managing the necessary blockchain-based payment, as detailed in the preceding section. Moreover, as the customer has provided access to the document package, the institution can retain a copy within its own database (Fig. 3).

In the suggested approach, the regulator assumes a central role as a trusted third party (TTP) and holds ownership of the "fabric layer." While this configuration is integral to the system, it may present a vulnerability if, for instance, the regulator becomes corrupt or is compromised due to hacking or insider fraud. This aspect warrants further examination in subsequent analyses. To address this potential vulnerability to some extent, the TTP characteristics delineated by Lee et al. (2016) could be integrated.

12 Decentralized KYC Solution

The solution proposed in the earlier section can undergo further decentralization through the following modifications. Firstly, if the DLT component of the solution is directly implemented on the Ethereum network instead of utilizing a private blockchain, any attempt to alter information on the blockchain would face increased difficulty due to the presence of a large, more resilient mining community. Secondly, the regulator could be eliminated from the system, eliminating the risk of having a party with an overarching view of the entire system. Lastly, additional efficiency could be introduced by storing data exclusively at the financial institution that has granted approval to the customer, as depicted in Fig. 5. While recognizing these advantages, discussions with experts suggest that, in most Western countries, the perceived risk of a corrupt regulator is deemed low compared to the benefits of enhanced financial stability resulting from the regulator's ability to routinely verify the KYC process.

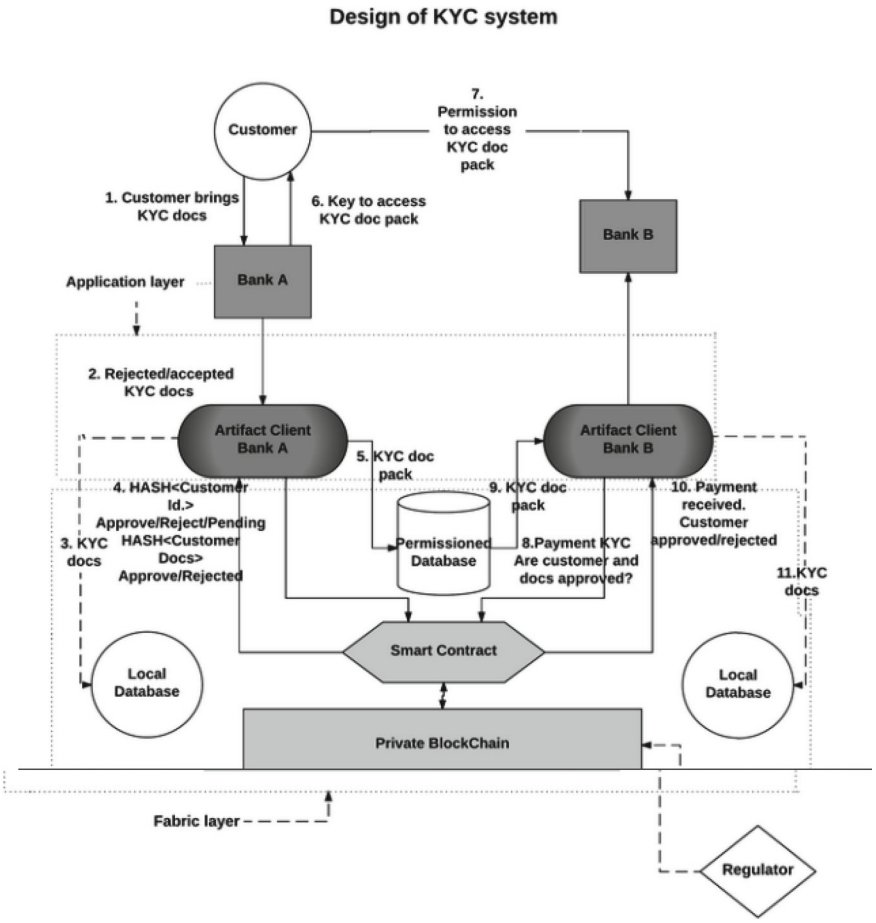


Fig. 3 Moyano [8] design of KYC process

The local storage of documents ensures that any bank working with a client can check the KYC documents whenever necessary. The decision to use a private distributed ledger instead of a public one in our proposed design was influenced by feedback from finance executives consulted during the DSR process. They indicated that banks might be uncomfortable with customers' private information being available on a public distributed ledger, even if only hash code values of documents and the key to decrypt the customer document package were kept on a public ledger. This concern is reasonable, as potential bugs in the smart contract or reverse engineering of the smart contract bytecode could unintentionally expose information. Luu et al. (2016) examined 19,366 smart contracts on Ethereum and identified vulnerabilities in 8,833 of them, supporting the concerns raised by the consulted finance executives. Moreover, the entire compensation scheme enabling cost reduction and sharing within the system is feasible only through the use of DLT. A more mature DLT would

facilitate a ledger where stored documents could be entirely private, allowing for a decentralized, permissioned database on a blockchain. In such a system, the document package would solely be stored on a distributed ledger, not on a central database managed by the regulator. Projects like R3 Corda and Hyperledger are progressing in this direction, and while they are not currently mature, they may become so in the near future (Fig. 4).

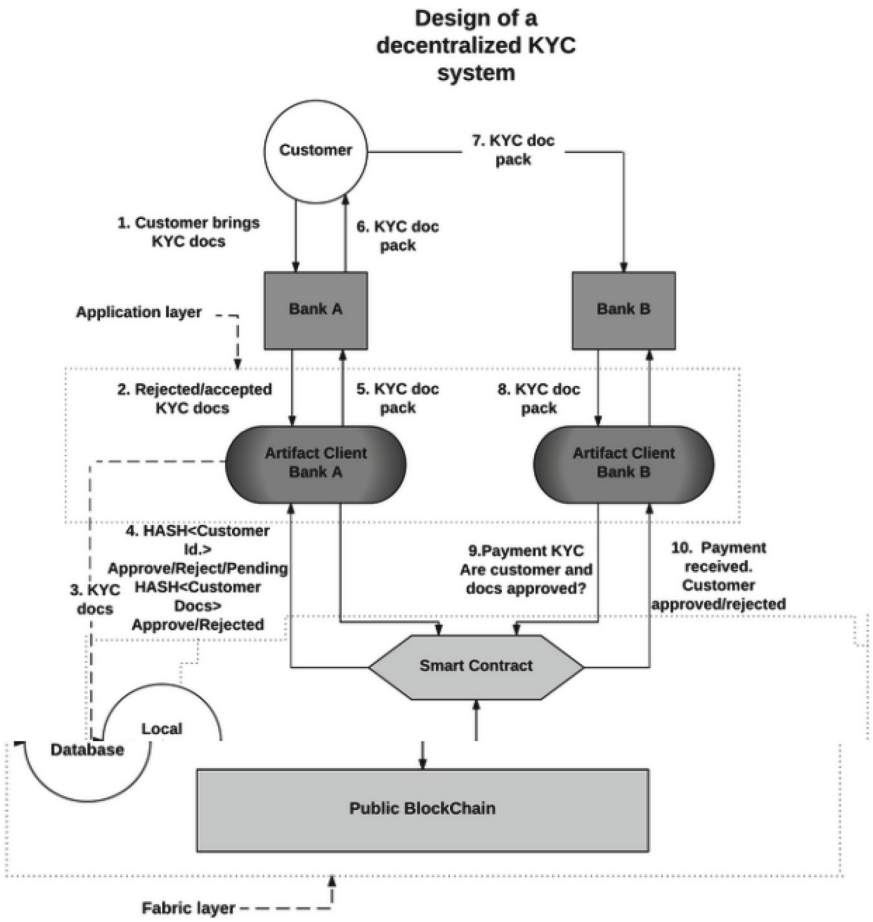


Fig. 4 Moyano [8] design of decentralized KYC system

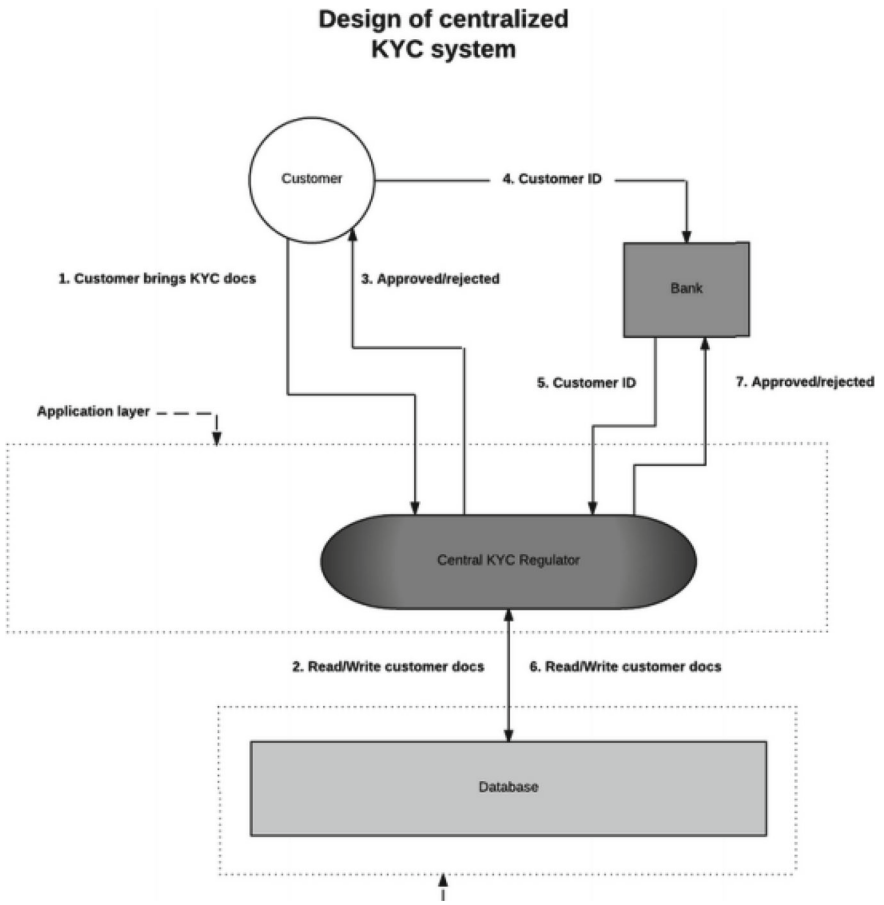


Fig. 5 Moyano [8] design of centralized KYC SYSTEM

13 Centralized KYC Solution

The effective functioning of Decentralized Finance (DeFi) markets might necessitate a significant level of centralization. Our research demonstrates that centralization, particularly through institutional investors facilitating Initial Coin Offerings (ICOs), results in shorter timeframes to achieve fundraising goals and higher valuations. Using a search-theoretical model, we quantify how centralization alleviates frictions in decentralized markets (Momtaz 2012). Centralization proves beneficial by reducing trading delays and enhancing overall efficiency, particularly during market downturns or instances of uncertainty regarding team or product quality. Consequently, our study suggests that fully decentralized markets for startups may not be optimal for society. Centralization's value lies in expediting interactions between entrepreneurs and investors, along with mitigating market frictions arising from

information asymmetry. (Bhatt, Joshipura) Over the past decade, technology has significantly transformed the design, delivery, and consumption of financial services. Increased mobile and internet penetration, coupled with the rise of Fintech, digitalization, blockchain technology, machine learning, and artificial intelligence, has accelerated the digital transformation of economies worldwide. The COVID-19-induced lockdowns further expedited the digitalization of financial services. This study identifies key areas and current dynamics in Fintech, digitalization, and financial services, proposing future research directions.

Artificial Intelligence emerges as the future of banking, leveraging advanced data analytics to combat fraudulent transactions and enhance compliance. The creation of Bitcoin in 2009 was a revolutionary idea in the financial world, representing the digital cash of the new age. It is considered secure, non-centralized, and has the potential to provide the world with "honest," non-inflatable money. (Meghani 2020).

This study explores the potential contributions of AI and blockchain technologies to the Indian banking sector. While blockchain technology shows promise, it is noted that AI applications are currently taking the lead in the banking sector, addressing customer demands for faster and easier services. AI is actively utilized for regulatory compliance, fraud detection, and assessing individual creditworthiness. Additionally, the research paper delves into the intersection of financial services and technological innovations, commonly known as Financial Technology (FinTech). It covers the definition of FinTech, its evolution, utilization, and innovations within the field. The study particularly focuses on four major sectors—Capital Market (primary and secondary), Blockchain technology (AI & ML), E-commerce & Marketing (API), and Banking & Insurance (unified payment system, SWIFT, wire transfer)—examining their role, disruptions, opportunities, and growth within the FinTech landscape.

The study explores the possibility of cost-sharing in the Know Your Customer (KYC) process through the implementation of a fully centralized KYC artifact. This involves assigning the responsibility of KYC to a specialized entity or a regulator-operated KYC office. Under this centralized model, the customer would need authorization from the designated entity, and every bank seeking to engage with that customer would obtain permission from the centralized authority. The primary advantage of this approach lies in reducing the KYC costs for banks and other financial institutions, fostering increased competition in the market. Consequently, lower fees for customers and reduced business costs could contribute to a more competitive and open business environment in a given country, without compromising Anti-Money Laundering (AML) or KYC requirements.

14 The Use of Distributed Ledger Technology

Distributed Ledger Technology (DLT), including blockchain, has the implicit to enhance the effectiveness of the Know Your client (KYC) process in severalways. DLT enables the creation of a participated and inflexible record of client information on a decentralizednetwork. Multiple realities can pierce and corroborate client data

without the need for spare data entry, reducing duplication and icingconsistency. DLT provides a single, empirical source of verity for clientinformation. This reduces the need for guests to submit the same information to multiple realities, streamlining the KYC process and minimizing data entryerrors. DLT can support decentralized identity results, allowing individualities to control and partake their identity attributes. Druggies can widely partake specific KYC information with different realities, perfecting sequestration and reducing the burden on guests to constantly give the same information. DLT creates an inflexible inspection trail of changes made to client information. This point enhances translucency and responsibility, making it easier for controllers and adjudicators to trace any changes made to KYC data over time. DLT allows for permissioned access to clientdata.

Authorized parties, similar as fiscal institutions or nonsupervisory bodies, can pierce the necessary KYC information directly, reducing the time and coffers needed for homemadechecks. Smart contracts on DLT can automate certain compliance checks grounded on predefinedrules. This robotization can speed up the KYC process by executing routine checks and flagging disagreement, reducing the homemade troubleinvolved. DLT facilitates interoperability, enabling different institutions to partake and corroborate KYCdata. Streamlined communication between institutions can expedite the KYC process, especially for guests with being biographies at otherentities. DLT reduces redundancy in datastorage. KYC information stored on a decentralized tally is accessible across sharing realities without the need for duplicated databases, leading to more effective data operation (Fig. 6).

DLT employs advanced cryptographic ways to secure data. This enhanced security reduces the threat of data breaches and fraud, contributing to the overall effectiveness and integrity of the KYC process. While the implicit benefits are significant, the factual perpetration and success of DLT in perfecting KYC effectiveness depend on factors similar as non supervisory considerations, assiduity collaboration, and the relinquishment of standardized protocols. Ongoing developments in this space may lead to farther advancements in the effectiveness of KYC processes using DLT. Having presented a result, it's worth considering why the use of DLT represents an enhancement compared to other possible technologies. First, there would be advancements in terms of auditing and shadowing. This is profitable for the public controller since it provides a clear record of the information that fiscal institutions corroborate previous to the opening of accounts, and could serve as a single point of verity should disagreement do. And the inflexible nature of the record created by DLT-grounded results can not be matched by other technologies. Second, the proposed system allows collaboration between fiscal institutions that don't necessary trust one another.

Specifically, given that fiscal institutions contend for guests' means and accounts, only a system that allows for anonymous collaboration—similar as anonymous compensation and anonymous document sharing—would gain the support of fiscal institutions. Third, one of the major benefactions of the result proposed then's that an institution can be anonymously and proportionately compensated by others for the sweats conducted to corroborate a client. This is only possible due to the features of the distributed tally, which allow institutions to communicate with one another

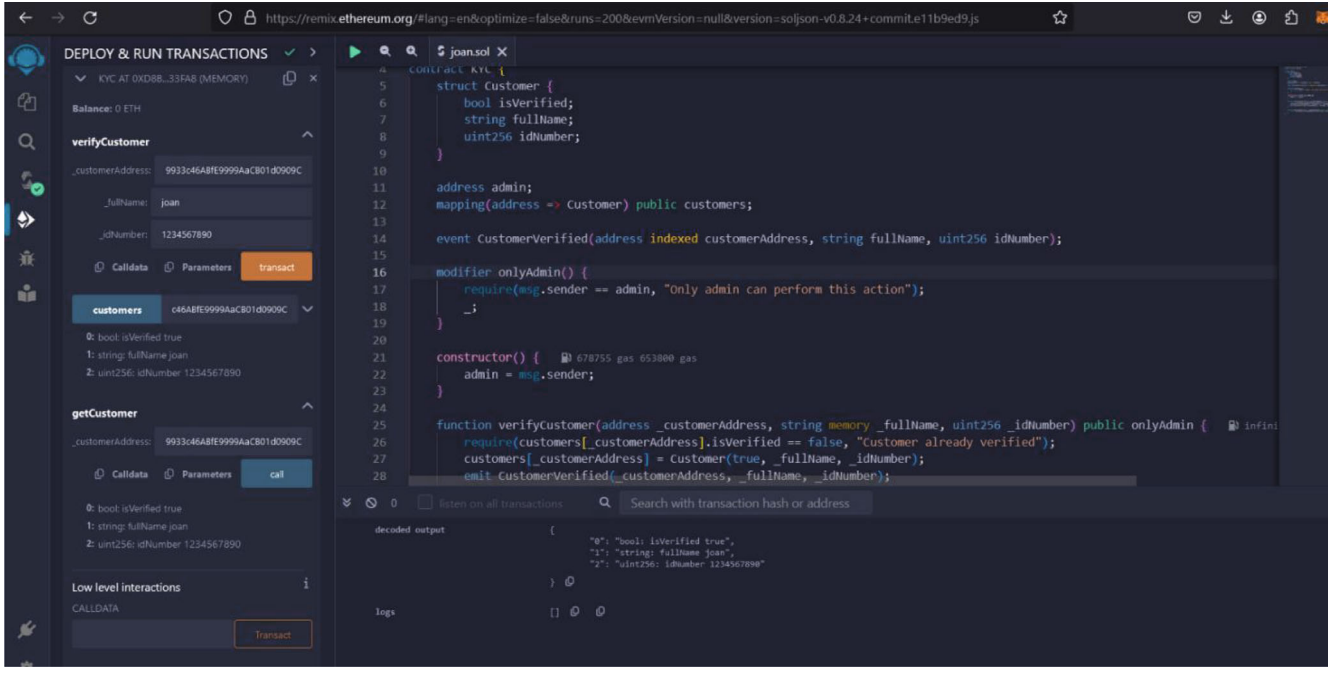


Fig. 6 Final decoded output of encrypted solidity of KYC process

without revealing their individualities but insure that each institution abides by all applicable regulations at all times. Fourth, it's important to note that the system proposed then—irrespective of the technology used to enable it—is, in substance, a system for interbank collaboration. Since fiscal institutions are studying broader interbank collaborations grounded on DLT—similar as the R3 design—it seems logical to propose a system similar as the one presented then, which formerly takes core DLT features into account, similar that it can, in the future, be integrated into a broader DLT—grounded frame. Last, and taking into account that such a new system would in any case need a clearing case to settle the compensations, DLT eliminates high central authority freights. All by each, the result proposed then from DLT for the following reasons the operation of this technology allows for the robotization of a process, increases the information available if a disagreement should do, reduces agreement time compared to other technologies, and reduces business costs.

15 Conclusion

The article has explored the potential of enhancing Know Your Customer (KYC) efficiency through the synergistic application of Distributed Ledger Technology (DLT), including blockchain, and the principles of Decentralized Finance (DeFi). The evolving landscape of financial services demands innovative solutions, and the integration of DLT and DeFi presents a promising avenue for revolutionizing the KYC process.

DLT offers a transformative approach to KYC by providing a decentralized and immutable ledger for storing customer information. This not only reduces redundancy in data entry but also establishes a single, verifiable source of truth, streamlining the KYC process and minimizing errors. The technology's cryptographic security ensures data integrity and enhances transparency, offering an immutable audit trail for regulatory oversight. Decentralized Finance principles, such as self-sovereign identity, further empower individuals in managing their KYC information. Users gain control over their identity attributes, selectively sharing data as needed. Integration with DeFi allows for interoperability, seamless communication, and standardized authentication processes across different financial platforms.

The proposed solution addresses challenges in the KYC process by facilitating collaboration among financial institutions. It introduces the concept of anonymous compensation, proportionate reimbursement, and streamlined communication, fostering an environment of trust and efficiency among participants. While acknowledging the potential benefits, it is crucial to consider regulatory frameworks, industry collaboration, and the adoption of standardized protocols for successful DLT implementation. Moreover, the proposed solution aligns with broader trends in interbank collaborations based on DLT, positioning it as a viable and forward-looking approach. The integration of DLT and DeFi in the KYC process represents a significant leap toward creating a more efficient, secure, and user-centric financial ecosystem. As

technology continues to evolve, fostering innovation and collaboration, the envisioned future of streamlined KYC processes appears not only feasible but essential for the continued growth and resilience of the financial industry.

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Bringing Together Machine Learning Techniques for Effective Phishing Email Detection

Prachi Sharma, Sajjad Ahmed, Hemraj Shobharam Lamkuche, Mutaz Rasmi Abu Sara, and Ala'a Al Sherideh

Abstract Email phishing constitutes a cyber-attack aiming to illicitly acquire sensitive data by masquerading as authentic sources. This paper outlines a machine learning-driven strategy for identifying email phishing attacks. The suggested approach encompasses extracting features from language processing and supervised learning algorithms, the system categorizes incoming emails as legitimate or phishing endeavors. The outcomes indicate that the proposed methodology attains remarkable accuracy, surpassing existing methods, thus offering a valuable tool for organizations and individuals seeking to enhance their email security.

Keywords Email phishing · Cyber-attack · Sensitive data · Machine learning · Phishing attacks · Features extraction · Natural language · Supervised learning algorithms · Email categorization · Email security · Technological progress

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1 Introduction

In the Fourth Industrial Revolution, artificial intelligence (AI) plays an important role in improving cybersecurity, especially in identifying phishing emails. AI algorithms examine email patterns and accurately detect harmful intent by utilizing machine learning and natural language processing techniques [1]. In an era dominated by digital Communication, the ubiquity of email serves as both a facilitators of seamless information exchange and a potential vector for malicious activities. Phishing, a deceptive practice wherein adversaries craft fraudulent emails to trick recipients into divulging sensitive information, poses a significant threat to individuals and organizations alike. As phishing attacks become increasingly sophisticated, conventional rule-based and heuristic methods struggle to keep pace with the evolving tactics employed by malicious actors.

Phishing attacks are a major concern for individuals and organizations alike. These attacks can results in significant financial and reputational losses. Machine learning techniques have shown great potential in detecting phishing emails. However, the performance of these techniques can be improved by integrating multiple techniques and using features engineering. This research paper aims to explore the different machine learning techniques used for phishing email detection and investigate how feature engineering can improve their performance. The paper will also discuss the challenges involved in integrating multiple learning techniques for effective phishing email detection.

2 Literatue Review

In [2], the authors introduced a model that relies on extracted features present in both the header and HTML body of emails. These features are then subjected to classification using a feedforward neural network. The outcomes demonstrate a classification accuracy of 98.72%.

Wang and Zhang explored the use of ensemble learning techniques for phishing email detection. They combined multiple classifiers, including Decision Trees, Support Vector Machines, and Neural Networks, to create an ensemble model. The approach enhanced overall accuracy to 95% and improved the system's ability to adapt to evolving phishing tactics.

In [3], a dataset comprising over 7000 emails was utilized, incorporating various features. The model achieved an impressive overall accuracy of 99.5%.

Chen et al. investigated the combination of deep learning and behavioral analysis for phishing detection. They proposed a hybrid model that integrated a convolutional neural network (CNN) for image-based analysis of email components and a recurrent neural network (RNN) for sequential behavior analysis. The combined model demonstrated robust performance with a precision of 96%.

3 Methodology

Figure 1 shows the explanation that would aid in understanding the design methodology for phishing email detection comprises several functional modules tailored to enhance system effectiveness. The methodology includes feature-based analysis module, natural learning processing The Feature-Based Analysis Module serves the purpose of extracting pertinent features from email components, fostering distinctive patterns for genuine and phishing emails. This process bolsters the algorithm's capacity to distinguish between the two categories.

The Natural Language Processing (NLP) Module focuses on analyzing linguistic nuances within email content, adding a layer of sophistication to detection mechanisms. The Behavioral Analysis Module scrutinizes user interactions, identifying anomalies indicative of targeted phishing attacks and contributing to an adaptive detection system. Additionally, the Integration Module ensures seamless collaboration between diverse machine learning techniques, promoting a holistic approach to phishing detection.

NLP algorithms analyze linguistic nuances, while behavioral analysis considers user interactions to identify anomalies. The goal is to fortify email systems, empowering them to autonomously learn, adapt, and discern patterns indicative of phishing attempts. This innovative methodology seeks to revolutionize email security by

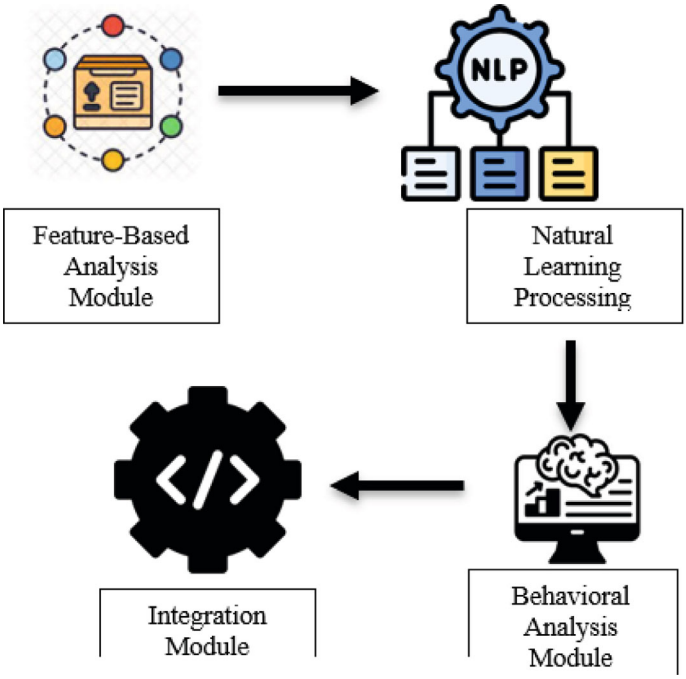


Fig. 1 Phishing email detection

creating a dynamic and resilient system capable of staying ahead of malicious actors in the ever-changing landscape of phishing strategies.

While deep learning models are commonly used in email phishing detection, feature engineering is another technique that can improve machine learning models' performance in identifying phishing emails. Feature engineering involves selecting the most important features to train a model, which can improve its accuracy in detecting phishing emails. For instance, data used for feature engineering should be representative of real-world phishing and benign emails [4]. One way to create a training dataset is through silent prediction emails, which can help identify spammy language and cancel the first prediction [5]. Additionally, a simple language model can be created for this second classification task [5]. Another approach is to use a second language model prediction of the email text to recognize spammy language and cancel the first prediction [5]. The Random Forest model can then make a prediction on an email and determine if the sender is phishing [5]. Furthermore, feature engineering can also use email body text to separate spam and phishing emails even from the same sender, leading to improved accuracy in phishing email detection [5]. Therefore, feature engineering is a powerful technique that can complement deep learning models and improve the overall performance of machine learning models in detecting phishing emails.

4 Feature Extraction

In this section we will discuss about the dataset. We have extracted a set of informative features from the email dataset containing 28,748 instances, each labeled with corresponding email text and email type (Phishing Email or Safe Email). We extracted this dataset from kaggle. The objective of feature extraction is to transform the raw email text into a structured and numerical representation that can be utilized by machine learning models for effective classification.

A. Text-Based Features

The email text is tokenized, and bag-of-words representation is created. This method captures the frequency of individual words within the text, disregarding the order. TI-IDF (Term Frequency-Inverse Document Frequency) is computed for each word in the email corpus. This technique assigns weights to words based on their frequency in a special email relative to their frequency across all emails, highlighting words that are discriminative for a particular instance.

B. Content Structure

Mostly phishing email have well-structured pattern and because of this it is hard to identify if the email is phishing or safe. Some identified email contain hyperlinks, as this is a common element in phishing emails. Phishing email sometimes contain

attachments, considering the potential risk associated with malicious file attachments. Attackers conduct stylometric analysis to identify deviations from normal communication patterns, including writing style, grammar, and sentences structure.

C. Linguistic Patterns

While checking the dataset we detected language inconsistencies or the use of multiple languages within the same email. Using NLP (Natural Learning Process) this include analyzing emotional tone of the email content to identify potentially manipulative or coercive language. The identified specific words or phrases commonly associated with phishing content, such as urgent requests, financial terms, or calls for immediate action.

By employing these features extraction techniques, we captured a comprehensive set of features that could effectively distinguish between phishing and safe emails within the large dataset. These features serve as input to the machine learning models employed in our study, facilitating the development of a robust and accurate phishing email detection system.

5 Experiment Setup

For the experimental setup the dataset was randomly spitted into training and testing sets to ensure an unbiased evaluation of model performance. We allocated 80% of the instances for training and the remaining 20% for testing. Prior to feature extraction and model training, we performed the preprocessing steps on the email text like breaking own the text into individual words, eliminating common and non-informative words and reducing words to their base or root form. These steps aimed to enhance the model's ability to capture relevant patterns within the email content. As described in Sect. 4, we employed a set of text-based, header information, content structure, and linguistic pattern features for each email instance. The feature extraction process resulted in a structured numerical representation suitable for machine learning.

We experimented with multiple machine learning algorithms, including SVM (Support Vector Machine), LSTM (Long Short-Term Memory), Word2Vec, Neural Network, Multinomial Naïve Bayes, Random Forest Classifier. For each algorithm, conducted hyperparameter tuning using techniques on the training set to identify optimal parameter configurations.

A. Support Vector Machine

We converted 'Email Text' into TF-IDF vectors using 'TfidfVectorizer'. This vectorizer is configured to consider a maximum of 1000 features and exclude English stop words. The model is used to make predictions on the set, and the results are evaluated using accuracy, confusion matrix, and classification report metrics. The overall accuracy of the model on the test set is reported as 95%, indicating strong performance. The model achieves a good balance between precision and recall, as

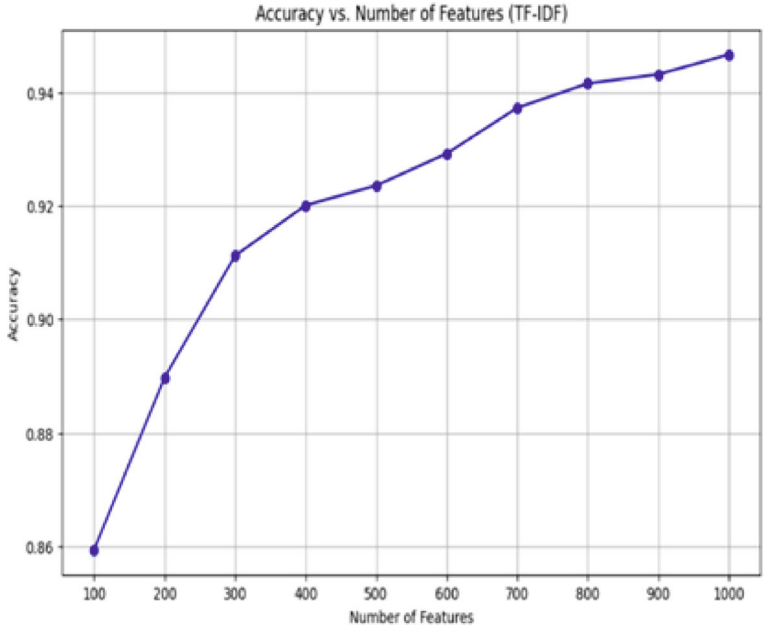


Fig. 2 Accuracy of the model versus number of features

evidenced by the F1-scores. The accuracy of 95% suggests that the SVM classifier effectively discriminative between phishing and safe emails in the dataset. We considered tuning hyperparameters for the SVM model to potentially improve performance further (Fig. 2).

B. Long Short-Term Memory

In Fig. 3 the process of refining the LSTM-based phishing email detection model, we iteratively adjusted key parameters such as the number of LSTM units, dropout rates, and learning rates. Through careful preprocessing and encoding, we trained the LSTM model. The model featuring an embedding layer and LSTM layer, achieved a notable accuracy of 96% on the test set after five epochs. This showcase the impactful role of LSTM-based methodologies advancing phishing email detection, contributing significantly to the cybersecurity landscape.

C. Random Forest Classifier

The overall accuracy of the model on the test set is 96%. This indicates that the model correctly predicted the email type for 96% of the instances. The model's predictions on the test set are evaluated using accuracy, confusion matrix, and a classification report, providing detailed metrics such as precision, recall, and F1-score for each email type. The confusion matrix and classification report offer insights into the model's ability to correctly classify Phishing and Safe mails, demonstrating the utility of the Random Forest approach in this text classification task (Fig. 4).

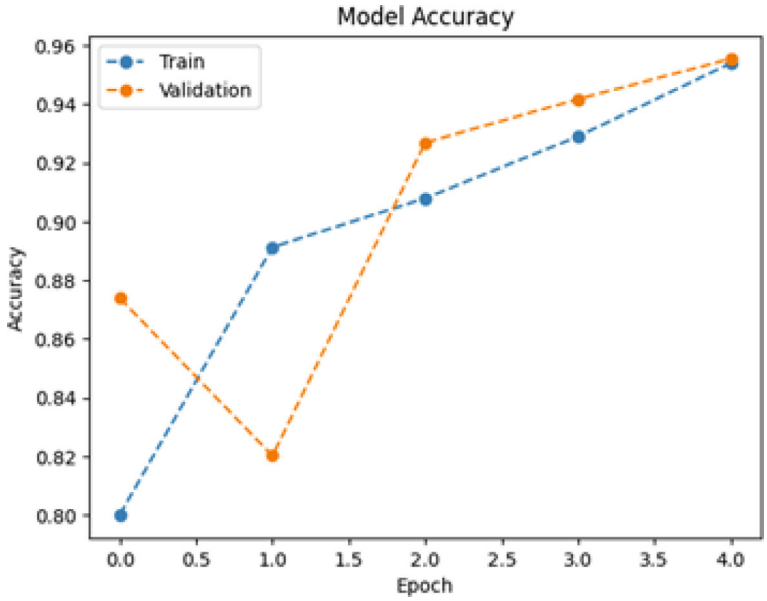


Fig. 3 Model accuracy of LSTM

Fig. 4 Random forest classifier



D. *Multinomial Naïve Bayes*

In Fig. 5 we imported necessary libraries for data manipulation, training, and evaluation. We created a Multinomial Naïve Bayes classifier and trains it on the bag-of-words representations of the training data. After using the trained classifier to predict the email types for the testing data. The model achieves an accuracy of 97%, demonstrating its effectiveness in classifying Phishing and Safe emails. The classification reports provides detailed metrics, indicating high precision, recall, and F1-score for both email types

E. Neural Network

For this section we used tokenizing and padding the text data for input to the neural network. After training Word2Vec embeddings on the training data we created an

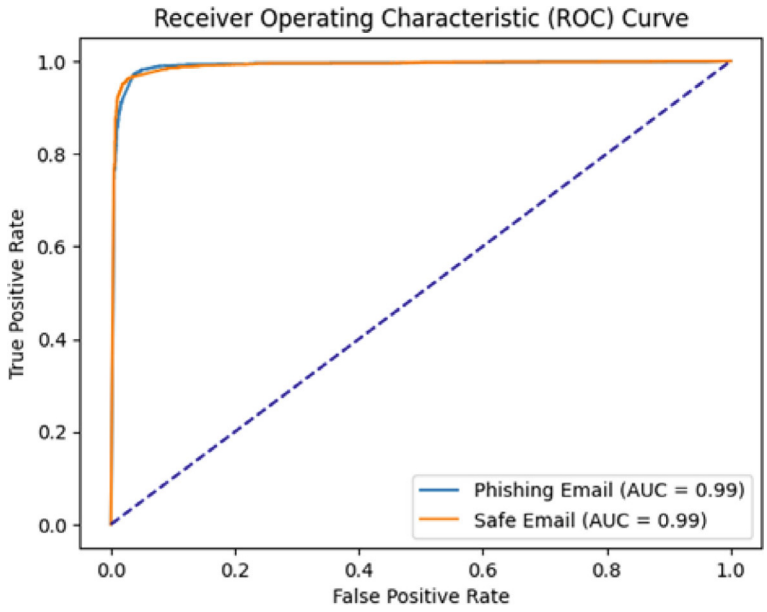


Fig. 5 ROC curve for multinomial Naïve Bayes

embedding matrix using the Word2Vec model. Following further we built a sequential neural network model with embedding layer, flattening, and dense layers. The model was compiled with Adam optimizer and binary cross-entropy loss. The model achieves an accuracy of 92%, demonstrating its effectiveness in classifying Phishing and Safe emails (Fig. 6).

6 Result

Table 1 illustrates the results of the algorithm. The Support Vector Machine (SVM) demonstrated robust performance, achieving a 95% accuracy with balanced precision and recall. On the other hand, the Long Short-Term Memory (LSTM) model excelled with an impressive 96% accuracy, leveraging its proficiency in capturing sequential patterns with email text. Word2Vec embeddings and Neural Network significantly enhanced the model's semantic understanding, contributing to a competitive accuracy of 92%. The random Forest Classifier Exhibited robust performance with a 94% accuracy, leveraging its ensemble nature to handle complex dataset effectively. Multinomial Naive Bayes, with its simplicity and efficiency, demonstrated a competitive accuracy of 97%. A comparative analysis revealed that each method has specific strengths—SVM in handling high-dimensional data, LSTM in capturing sequential patterns, Word2Vec in enhancing semantic understanding, Neural Network in deep

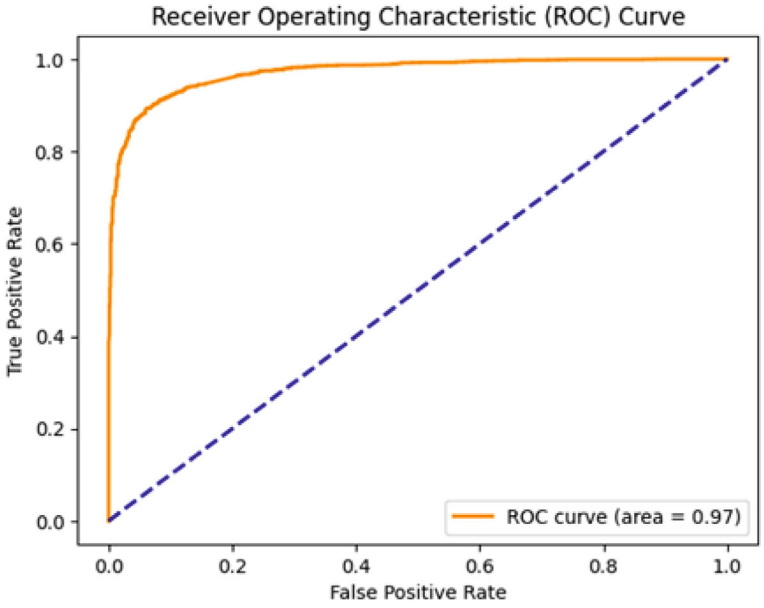


Fig. 6 ROC curve for neural network

Table 1 Result of the algorithms

Algorithm	Accuracy (%)	Precision	Recall	F1-score
Support vector machine	95	0.94	0.95	0.95
Long short-term memory	96	0.97	0.95	0.96
Neural network	92	0.92	0.91	0.91
Multinomial Naïve Bayes	97	0.97	0.97	0.97
Random forest classifier	96	0.96	0.96	0.96

learning, Multinomial Naïve Bayes in simplicity, and Random Forest in managing complex datasets.

7 Conclusion

In conclusion, email phishing attacks pose significant threats to individuals and businesses. By leveraging machine learning, organizations can enhance their email security and mitigate the risks associated with these attacks. The combination of feature extraction, natural language processing, and supervised learning algorithms provides a robust defense against phishing attempts.

As technology continues to advance, future advancements in email security may include the integration of advanced anomaly detection techniques, the use of unsupervised learning algorithms, and the incorporation of real-time threat intelligence. By staying vigilant, adopting best practices, and embracing the power of machine learning, we can unmask email phishing attacks and protect sensitive data from falling into the wrong hands.

8 Future Work

The future of cybersecurity lies in seamlessly integrating machine learning algorithms with human expertise to enhance the accuracy and efficiency of email threat detection. By combining the analytical capabilities of artificial intelligence with the intuition and experience of cybersecurity professionals, organizations can create a robust defense system against phishing attacks. This collaborative approach allows for real-time monitoring and adaptive responses to evolving threats, ensuring that malicious emails are swiftly identified and neutralized before they can cause any harm [5–7]. Through this fusion of technology and human intelligence, the future of email security is bright and promising [8].

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Legislation on Information Protection and Cybersecurity: Evaluating the Effectiveness of Policies in Addressing Cybercrime



Omar Al Makhzoumi and Abeer Zohair Said Saada

Abstract The objective of this research is to delve into the realm of cybercrime, with a particular focus on examining its concept through legislative, jurisprudential, and judicial lenses. It involves the classification of various forms of cybercrimes, such as attacks on information systems, financial offenses, sexual offenses, and crimes against public security. The research aims to grasp the distinctive attributes of cybercrime, including its ability to remain hidden and its rapid evolution, while also identifying the obstacles faced by security and judicial authorities in confronting these crimes. The findings shed light on the disparities in the definitions of cybercrime across different countries and legal frameworks, underscoring the necessity for a unified international definition. Moreover, the research highlights the wide array of cybercrime types and the challenges arising from their unique nature, such as the swift obliteration of evidence and the lack of technical expertise among authorities. Based on these outcomes, the research recommends the standardization of definitions and legislations pertaining to cybercrime, as well as the enhancement of international collaboration to combat these offenses. It also emphasizes the need to improve technical capabilities and provide technical training to security agencies, while regularly updating laws to keep pace with technological advancements. Lastly, the research underscores the significance of raising awareness and promoting education about the risks associated with cybercrime, along with preventive measures.

Keywords Cybercrime · Digital security · Electronic threats · Combating cybercrime · Electronic legislation · Information protection · Cybersecurity

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1 Introduction

With the rapid progression of technology and the prevalent use of the internet in our current era, the rise of cybercrime has become an ever-growing concern for the security of individuals, economies, and societies as a whole. The landscape of these criminal activities has expanded to encompass various forms, such as information system breaches, financial fraud, cyber blackmail, and invasions of privacy. This emphasizes the pressing necessity to comprehend the scope of these crimes and devise efficient approaches to counteract them [1].

The commission of criminal acts utilizing digital technologies and the internet, commonly known as cybercrime, has a direct impact on both individuals and organizations. These illicit activities possess distinct attributes, including the capacity to mask the identity of the offender, the constant evolution of techniques employed, and the arduousness in tracing relevant evidence. As a result of these distinctive qualities, law enforcement and security agencies encounter substantial obstacles when it comes to combating these offenses and minimizing their consequences.

With the information presented, the objective of this study is to delve into the realm of cybercrime, examining it from various angles such as its definitions, classifications, and challenges. The study aims to present a thorough examination of how different legal frameworks address these crimes, while also proposing suggestions for efficient management. By scrutinizing existing literature and analyzing real-life scenarios, the study aspires to offer fresh perspectives that can bolster endeavors to combat cybercrime and safeguard individuals and communities against its detrimental effects.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the concept of cybercrime from a legislative, jurisprudential and judicial perspective in Jordan and other countries, focusing on the development and differences in these definitions.
- Classify types of cybercrime, including attacks on information systems, financial crimes, sexual crimes, and public security crimes, with illustrative examples of each type.
- Explore the distinctive features of cybercrime, such as stealth, rapid evolution, and the challenges of proving these crimes.
- Review the difficulties security and judicial authorities face in prosecuting cybercrime, including the rapid disposal of evidence, lack of expertise and insufficient regulation.

1.2 Methodology

By utilizing a comparative methodology, the study aimed to shed light on the distinctions and similarities in cybercrime legislation between Jordan and other nations. This approach allowed for a comprehensive understanding of how each legal system tackles these issues, enabling us to offer recommendations based on global best practices. To analyze various perspectives on cybercrime, the study employed an analytical approach, examining legal and research literature to identify the most influential and well-founded viewpoints. Additionally, a descriptive approach was taken to provide an intricate portrayal of the application of laws and judiciary practices in this domain. This comprehensive analysis not only supported theoretical concepts but also assessed the practical implementation of laws and their effectiveness in combating cybercrime.

2 Nature of Cybercrime

The internet's extensive utilization has given rise to a fresh breed of criminal activity, taking place in the thriving and advancing digital realm, employing innovative methods and strategies. Cybercrime is referred to by multiple labels and descriptions, encompassing computer offenses, computer misuse, digital criminality, information-based criminal acts, electronic misconduct, and internet-related crimes. Below is a detailed presentation of the concept of cybercrime:

Legislative Definition of Cybercrime

In the Cybercrime Law No. (27) of 2015, the Jordanian legislator chose not to provide a specific definition for cybercrime. Rather, the law focuses on the criminalization of specific actions that have an impact on information systems, websites, and electronic networks. It also addresses the use of electronic methods to commit certain offenses, as outlined in Articles (3–12). The responsibility of defining cybercrime is left to the interpretation of legal experts and the judicial system.

According to Article (8/1) of the Information Network System in Saudi Arabia, cybercrime is defined as any action that involves the utilization of a computer or information network in contravention of the regulations outlined in this system. Similarly, in Texas, the American legislature has defined computer crimes as the unauthorized utilization of computer systems or data files in Law No. (1213) of 1986 [2].

According to Article 1 of the Cybercrime Law No. (14) of 2014 in Qatar, the Qatari legislator provides a definition for cybercrime as any unlawful utilization of information technology, an information system, or an information network that contravenes the regulations outlined in the law.

The researchers assert that it would be unfair to fault the Jordanian legislator for the absence of a specific definition of cybercrime, as the responsibility for defining

such terms lies within the realm of legal doctrine rather than legislative action. Consequently, it would be unjust to deem the Jordanian legislator lacking in their failure to provide a definition for cybercrime.

Jurisprudential Definition of Cybercrime

The concept of cybercrime is defined differently in various legal systems. In one perspective, it is described as the unlawful utilization of a computer to accomplish illicit goals [3]. However, another viewpoint characterizes cybercrime as any offense that involves electronic means, such as information systems, networks, or websites, including crimes committed through these mediums [4].

One viewpoint characterizes cybercrime as the commission of illegal actions that necessitate substantial understanding and proficiency in computer technology to carry out and accomplish [5]. An alternative definition portrays cybercrime as the perpetration of unlawful acts with the intention of modifying, replicating, erasing, or gaining access to stored computer data [6].

According to the researchers conducting this study, the term 'cybercrime' serves as an umbrella term encompassing all crimes committed within the realm of computers and the internet. This inclusive term not only covers a wide range of criminal activities in the digital space but also adapts to incorporate advancements in information technology and the ever-evolving methods and tools used to perpetrate these crimes.

The researchers suggest that cybercrime can be described as engaging in activities that are deemed criminal under the law, wherein a computer system is utilized to execute said activities, with the intention of gaining unauthorized access to electronic information and data using various methods or techniques related to information technology."

Judicial Definition of Cybercrime

The Jordanian Court of Cassation emphasized the unique nature of cybercrime, which has evolved alongside scientific and technological advancements that enable the creation of manipulated images and videos. To ensure the pursuit of truth in the court's proceedings, it was crucial to carry out the necessary technical expertise through the cybercrime department. Unfortunately, the Public Prosecutor failed to conduct this essential analysis, resulting in a lack of conclusive legal evidence to establish the defendant's guilt in the charged crime of indecent assault as defined by Article (296/1) of the Penal Code. Consequently, the court was compelled to declare the defendant's acquittal due to the absence of proof [7].

Upon careful examination of the aforementioned decision made by the Court of Cassation, it becomes apparent that this particular text cannot be deemed as a conclusive legal definition of cybercrime. This is due to the fact that it lacks a precise delineation of the actual cybercrime, focusing solely on the evidential process. Consequently, it can be inferred that there is currently no established judicial definition for cybercrime.

2.1 Types of Cybercrime

Cybercrime, like other types of crime, encompasses a wide range of forms and objectives. Researchers and legal scholars have categorized cybercrimes into various types, all of which involve criminal activities carried out using electronic methods. These include:

First: Crimes Against Information Systems, Devices, and Networks

Acts of wrongdoing are perpetrated against the intangible aspects of computer systems, specifically information and data. Instances of such misconduct encompass activities like infiltrating computers or networks, developing viruses that propagate through computer networks and the internet, as well as offenses involving the sabotage or disturbance of systems and data [8].

Unauthorized access is a prevalent offense within this classification, encompassing acts that target computer data or services with the intention of compromising content, confidentiality, or disrupting system functionality and effectiveness. The commission of this crime entails physically entering the computer's logical components with the purpose of gaining access, while the perpetrator's criminal intent, demonstrated through their knowledge and will, constitutes the moral aspect of the offense, as it is an intentional act [9].

Cybercrimes encompass a range of malicious activities directed towards information systems. These activities involve targeting websites on the World Wide Web and manipulating them in various ways, such as deleting, adding, disclosing, destroying, blocking, altering, modifying, changing, transferring, or copying information or data. Additionally, cybercrimes include actions that disrupt the functioning of an information system, tamper with websites, destroy or cancel them, modify their content, or engage in impersonation of their owners. All of these acts have detrimental effects on others and are classified as cybercrimes [10].

The Trojan Horse virus, a highly infamous internet virus, wreaked havoc on numerous internet users, resulting in substantial damage. Its target was four countries: Norway, England, Denmark, and Sweden. This malicious virus infiltrates users' systems via electronic programs and coerces them into paying $378 to prevent the virus from spreading to other devices. Failure to comply will result in the destruction of their computer's files and data [11].

Second: Crimes Affecting Money and Communications

This category of crimes encompasses the unlawful acquisition of money, programs, data, and electronic services. The physical aspect of these offenses involves the act of taking someone else's movable property, while the mental aspect involves the intention to obtain and retain the stolen money, data, programs, or services [12].

Online gambling is a prevalent form of financial cybercrime, with countless websites offering dedicated platforms for users to partake in gambling activities. These virtual clubs provide individuals with the opportunity to gamble online.

Notably, the United States allocates a significant amount of money, around one billion dollars each year, towards this form of entertainment [13].

Money laundering online is a significant financial offense that frequently stems from illicit activities such as drug trafficking, gambling, and the sex trade. This particular crime encompasses various actions, including but not limited to stock market speculation, real estate transactions, and the acquisition of gifts and antiques. It is challenging to provide an exhaustive list of all the activities involved [14].

Crimes within the realm of communications can encompass the deliberate targeting of telephone and internet connections. These criminal activities may involve the falsification of telephone line cards or the illicit extraction of phone numbers and recharge cards belonging to telecommunications companies. Consequently, individuals unlawfully obtain these numbers without the knowledge or consent of the companies that rightfully possess them [15].

Third: Crimes Against Individuals and Sexual Crimes

Online sexual crimes involve two key elements: the material element and the moral element. The material element pertains to the publication of explicit content on a website, while the moral element focuses on the perpetrator's intention to distribute said material, fully aware of the consequences. The objective of this type of crime is to inflict harm on individuals and undermine their social standing. The material element encompasses observable conduct that occurs in public view.

The exploitation of children through online sexual crimes is an extremely perilous phenomenon. Specialized platforms actively seek to entice and ensnare children in traps involving sexual exploitation and prostitution. They accomplish this by utilizing various channels such as social media, chat platforms, and messaging services [18].

Articles 9 and 10 of Jordan's Electronic Crimes Law No. 27 of 2015 specifically tackle the issue of these offenses. These provisions encompass various actions related to pornographic content, such as its promotion, publication, and display. The Jordanian legislature has placed particular emphasis on the potential effects of pornographic material on individuals below the age of eighteen.

Fourth: Public Security Crimes and Human Trafficking

With the proliferation of computers and the advancement of the internet, a new form of warfare has emerged, commonly referred to as cyber warfare. This type of warfare entails one nation infiltrating another in order to acquire sensitive information pertaining to security, military operations, and economic affairs. It is worth noting that the internet, initially developed by military establishments, contains a wealth of military-related content, particularly in regards to state affairs and military affairs. Consequently, cyber espionage has become a prevalent form of electronic criminal activity, specifically targeting military and security-related information [19].

Cyber espionage, a prominent form of criminal activity that poses a significant threat to security, revolves around the perpetrator utilizing electronic systems to breach a digital repository of classified data. This unauthorized access enables them to not only view but also duplicate the information contained within. The ethical

aspect of this crime encompasses both a general intention to cause harm and a specific intention to inflict damage upon the state [20].

There has been a revelation concerning human trafficking, as it has come to light that organized criminal groups are involved in the despicable act of white slavery. These groups orchestrate transactions involving girls from developing nations and Eastern Europe, subjecting them to exploitation for the purposes of pleasure and sexual exploitation. They even go as far as distributing catalogs containing photographs, details, and prices of these girls, and once agreements are reached, meetings are arranged, resulting in the generation of millions of dollars from these illicit operations [21].

3 Special Nature of Cyber Crimes

The rise of cybercrime can be attributed to the progress made in technology, making it a distinct form of criminal activity. Unlike traditional crimes, cybercrime presents new and unique characteristics that were previously unfamiliar to society. In order to provide a comprehensive understanding of this phenomenon, the following section will be divided into two subsections.

3.1 Proving Cybercrime

The task of establishing the occurrence of cybercrime is fraught with difficulties due to its inherent characteristics. These challenges encompass its concealed nature, the rapidity with which it is carried out, its comparatively lesser degree of violence in execution, and its ability to transcend borders. All of these elements present formidable barriers when it comes to providing evidence for cybercrime.

The term "electronic evidence" refers to information that is obtained through lawful and scientific means by extracting stored computational data from computers and networks. This evidence, which is deemed credible and reliable, is utilized in investigations and court proceedings to establish an individual's culpability in the commission of a crime [22].

Digital evidence, in its various forms including images, written texts, sounds, and graphics, serves as a crucial element in establishing a legally admissible connection between the crime, the victim, and the perpetrator. The definition of digital evidence provided by the Egyptian Electronic Signature Law, specifically in Article 1(b), describes it as an electronic document comprising data messages that have been generated through electronic, digital, optical, or similar methods. In this regard, there are two points to address:

Concealment of the Crime

Cybercrime is marked by its ability to hide and blend in, making it difficult for victims to detect while they are online. The cybercriminals possess advanced technical abilities that allow them to execute their crimes with utmost accuracy. They can discreetly steal and erase data, covertly monitor information, and surreptitiously pilfer money and communications, all without the victim even realizing a crime has taken place. This illicit activity is carried out through the covert manipulation of electronic signals and pulses that store data, requiring the criminal to possess expertise and knowledge in this specialized field [23].

The rapid growth and progression of knowledge and technology in cyberspace have resulted in a noteworthy phenomenon: cybercrime is evolving and advancing at a rate that surpasses legislation. On one side, there is the swift development of technology, while on the other side, cybercriminals convene conferences where they devise intricate techniques and tools. This necessitates constant updates to legislation in order to effectively combat cybercrime [24].

The researchers assert that legislative reforms must align with the rapid progress of scientific advancements. As technology takes one step forward, legislation should take ten steps forward to keep up. It is imperative for lawmakers to stay informed about the latest advancements in communication and information technology, particularly those stemming from the internet. In today's world, it is crucial to have experts in modern software who can provide guidance and support to legislators as they introduce or modify laws. This ensures that legal authority remains effective and does not fall behind the ever-evolving landscape of cybercrimes [25].

Speed of Commission

The perpetration of cybercrime does not demand extensive exertion or the use of force; instead, it can be accomplished with minimal effort and without any physical strain, unlike conventional crimes like theft, assault, murder, or breaking into premises. This form of crime operates silently, avoiding any acts of violence, and necessitates only a decent understanding of computers and information technology to engage in unlawful activities. All that is required is access to the internet and a knowledgeable criminal who can effectively exploit it [26].

The boundaries of information transfer between nations have become intangible and imperceptible. Thanks to the advancements in computer technology and the internet, it is now possible to seamlessly exchange and transmit massive quantities of data and information across different systems in various countries. This occurrence can impact numerous individuals simultaneously [27]. The repercussions of cybercrime extend far beyond the immediate target, encompassing ethical, religious, educational, and economic ramifications for others. As a result, countries have implemented international agreements to counter this menace [28].

3.2 Difficulties in Prosecuting Cybercriminals

Individuals who possess extensive knowledge of computer systems and expertise in electronic matters are commonly referred to as cybercriminals. These individuals engage in cybercrime, which involves the manipulation of data and information using technical skills and techniques. This type of criminal activity is often referred to as "smart crime" due to its reliance on advanced technological know-how [29]. Cybercriminals can be categorized into two distinct groups based on their intentions and capabilities:

1. **User Cybercriminals**: Those who possess a solid comprehension of computers and software sometimes engage in cybercrimes for the purpose of demonstrating their abilities or for personal entertainment, with no intention of monetary gain.
2. **Programmer Cybercriminals**: Individuals with high expertise in breaching computer systems and networks with relative ease [30].

Firstly: Speed of Evidence Erasure and Technological Barriers to Access

The transmission and storage of information and data through the internet involve encoding and storing them in formats that are exclusively readable by computers. However, accessing this information poses a significant challenge and necessitates the expertise of specialized professionals who meticulously analyze extensive quantities of data, information, and stored records to track down evidence against the offender [31].

Specialized software allows for the swift eradication of cybercrime evidence from a computer system, as the perpetrator can rapidly issue commands. If detection is suspected, these commands can be easily canceled, posing a significant challenge in identifying and exposing the offender [32].

Secondly: Lack of Expertise Among Security and Judicial Authorities and Insufficient Existing Laws

Dealing with cybercrimes necessitates the utilization of specialized investigative techniques and strategies. Relevant authorities frequently lack the necessary technical expertise, highlighting the need to enhance security and judicial systems in order to effectively combat cybercrimes. Traditional legal frameworks often prove insufficient in addressing these offenses, underscoring the importance of regularly reviewing and revising laws to keep pace with the evolving tactics employed by cybercriminals [33].

Thirdly: Victims' Reluctance to Report

The act of not reporting cybercrime is a common occurrence, often resulting from either the difficulty in detecting such crimes or the fear experienced by victims who are reluctant to bring attention to themselves and risk damage to their reputation. This issue is especially prevalent within financial institutions, as they may be hesitant to report these crimes out of concern for the potential negative consequences it may have on their standing and the trust of their customers [34].

In criminal cases, both the French and Egyptian legislators have placed significant importance on the judge's personal conviction. This emphasis is evident in Articles 427 and 536 of the French Code of Criminal Procedure and Article 302 of the Egyptian Code of Criminal Procedure of 1950. Unlike civil judges, criminal judges are entrusted with the responsibility of carefully examining and assessing the credibility of evidence, free from any interference by the legislative branch [35].

Article 54 of the Jordanian Civil Code acknowledges the significance of cybercrime and its implications. It explicitly states that any entity or asset that can be legally owned and utilized, without violating any laws or regulations, falls within the realm of transactions. This encompasses financial rights associated with cybercrimes. The objective of this provision is to deter offenders from escaping accountability by asserting that data and information lack monetary worth or are not deemed economically valuable by the legislator [36].

4 Conclusion

To sum up, this research emphasizes the significance of addressing cybercrimes from a comprehensive legal standpoint. The study has effectively showcased the need for a well-rounded legal approach to tackle the challenges posed by cybercrimes, transcending national boundaries and requiring the establishment of local laws that align with global standards. Through the utilization of comparative, analytical, and descriptive methodologies, we have successfully identified the strengths and weaknesses of existing legal frameworks and put forth practical recommendations to enhance strategies in combating these crimes. Achieving effective outcomes in this domain necessitates collaboration between legal and legislative bodies, alongside heightened public awareness and the development of legal techniques to keep up with rapid technological advancements.

4.1 Findings

The study concluded with the following findings:

- Due to differences in countries and legal systems, the definition of cybercrime varies, highlighting the necessity for a comprehensive and universally accepted international definition.
- Cybercrime encompasses a diverse range of types, such as attacks on information systems, financial fraud, sexual offenses, and crimes against public security.
- Traditional methods often struggle to trace and prove cybercrime due to its unique traits of invisibility and rapid evolution, which pose significant challenges.

- The study brought attention to notable obstacles encountered when prosecuting cybercrimes, such as the swift deletion of evidence, insufficient technical knowledge within security agencies, and the insufficiency of existing legislation.

4.2 Recommendations

Based on the findings, the study recommends the following:

- Harmonize the definition of cybercrime and improve coordination between countries to develop standardized laws that effectively combat cybercrime.
- Improve technical training and qualifications of security and judicial authorities to deal with cybercrime and develop new techniques for tracking crimes and documenting evidence.
- Regularly review and update cybercrime laws to keep up with technological advances and new techniques used by criminals
- Increase awareness and education among individuals and organizations about the threats of cybercrime and how to protect and prevent yourself.
- Strengthen international cooperation between countries and institutions to combat cybercrime, including the exchange of information and expertise and the coordination of investigations.

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Semantic Ambiguity in BBC and CNN News Papers Headline



Wafa Abu Hatab, Sarah Al-Refai, and Mohammed Al-Badawi

Abstract The purpose of this research was to examine the use of ambiguity in newspaper headlines, specifically focusing on the headlines of BBC and CNN. A qualitative and descriptive approach was employed to identify the different types of ambiguity present in the headlines. The data collection technique involved collecting news headlines from the online versions of BBC and CNN, resulting in a total of 13 headlines. To classify the ambiguity, the researcher utilized Kreidler's theory (1998). The findings revealed that lexical ambiguity was the most prevalent type of ambiguity in the news headlines, with 11 out of the 13 headlines containing this type. Additionally, 5 headlines exhibited homonymy, while 6 headlines demonstrated polysemy. The remaining 2 headlines displayed syntactic ambiguity, specifically surface structure ambiguity.

Keywords Lexical · Semantics · Words · Ambiguity · Polysemy · Homonymy

1 Introduction

Language serves as a means of everyday communication, allowing us to convey specific meanings to ensure mutual understanding. When engaging in conversation, it is crucial that we are able to comprehend and gather information from our interlocutors, thus avoiding any potential misunderstandings. Language functions as a

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sign system based on sound, with each sign representing a concept, idea, thought, or understanding.

Just like telegrams, news headlines serve as a navigational tool, directing readers towards specific information. They not only provide a concise summary of the news article but also aid readers in understanding its underlying significance. Editors strategically choose certain headlines to emphasize particular aspects or highlight noteworthy situations.

The primary goal of a news headline is to captivate readers and encourage them to delve further into the article. Whether it's addressing a specific question, offering a resolution to a problem, or presenting a notable advantage to the reader, the words chosen by headline writers play a crucial role. It is essential for the headline to be self-contained, delivering its message effectively.

The utilization of ambiguity by news headline writers serves multiple purposes, including generating comedic effect, captivating readers' focus, and fostering intrigue.

The utilization of ambiguity can serve as a means to communicate information indirectly, thereby potentially impacting the reader in a positive manner. However, it is important to note that certain perplexing news headlines have the potential to be misleading, leading to confusion and hindering readers from fully comprehending the intended message. Consequently, this may result in the reader opting not to proceed with further reading [1].

In order to captivate readers and maintain their engagement with the content, it is crucial to identify and eliminate any forms of ambiguity that may confuse them. While individuals can easily seek clarification from a speaker when faced with difficulties in comprehending spoken or written sentences, incorrect wording can lead to misinterpretation by the reader. This issue is particularly evident in newspaper headlines, where the editor employs homophones, homographs, and specific sentence structures to create catchy titles that provide a glimpse into the article's content. However, headlines must be concise and composed primarily of lexical words such as nouns, verbs, and adjectives. Unfortunately, these factors contribute to the presence of ambiguity, causing readers to experience confusion [2].

The researcher's focus was on investigating the utilization of ambiguity within headlines.

1.1 Statement of the Problem

The headline of a news report holds immense significance, serving as a vital element in conveying information. Journalists employ ambiguity, whether intentional or unintentional, when crafting these headlines.

Ambiguity, a widespread issue in language, is particularly prevalent in English, one of the world's most influential languages, manifesting in both oral and written communication. The semantic complexities of ambiguity lie in the potential for

multiple understandings of specific linguistic expressions used by speakers or heard by listeners, encompassing words, phrases, and sentences [3].

Indicating the forms of ambiguity that captivate readers and compel them to continue reading is crucial, as uncertain headlines have the potential to deter readers from engaging further. This discouragement extends beyond just the initial news headline, but can also impact their willingness to peruse the entire newspaper.

The absence of any research exploring the specific types of ambiguity that can pose challenges to readers and deter them from engaging with the text is noteworthy. Understanding and categorizing these types of ambiguity is crucial as it can offer valuable insights and guidance to news headline writers.

1.2 Objective of Study

The ultimate goals of the present work are:

1. To identify the types of ambiguity
2. To find out the dominant types of ambiguity used in the headlines of CNN and BBC news.

1.3 Questions of the Study

1. What are the types of ambiguity?

What are the dominant types of ambiguity used in the headlines of CNN and BBC news?

1.4 Limits of the Study

This study conducted in Jordan-Zarqa during the second semester 2022.

2 Literature Review

2.1 Theoretical Framework

In this study, the principles of data analysis are guided by Kreidler's theory [4], which introduces the concept of ambiguity. This phenomenon provides clear classifications and terminology that facilitate the researcher's data processing efforts [5].

Semantics

Semantics, as defined by Crystal [6], is a significant field within linguistics that focuses on the examination of meaning in language (p. 428). Kreidler [4] further explains that linguistic semantics explores how languages structure and convey meaning, while semantics itself is the scientific investigation of meaning. Saeed [7] offers a slightly different perspective, defining semantics as the study of words within sentences. Riemer [8] adds to this understanding by describing semantics as the analysis of fundamental units of meaning that cannot be deconstructed conceptually.

According to the Longman Dictionary of Contemporary English, semantics is the field that focuses on understanding the meaning of words and phrases. Therefore, the primary objective of semantic research is to study and analyze meaning, as evident from various definitions provided earlier.

The study of semantics revolves around deciphering the significance conveyed by linguistic expressions. Moreover, semantics must possess the capacity to delineate the meaning of any given language expression, taking into account various factors such as context and the interplay of meaning attributes or relationships. Due to the intricate nature of meaning and its multifaceted dimensions, a comprehensive definition would prove unattainable.

Ambiguity

Upon encountering texts that incorporate the term "ambiguity," we possess the ability to discern its intended significance within that particular context. However, in the absence of contextual clues, the full spectrum of meanings associated with the word becomes apparent, leaving us unable to ascertain the appropriate interpretation. It is widely agreed upon that we should rely on words that adhere to established conversational norms, as they possess a certain allure. The utilization of specialized writing languages can give rise to confusion, as the conveyed meaning may not always align with the author's intended message. Consequently, this discrepancy fosters the emergence of ambiguous interpretations [9].

Ambiguity arises from the presence of both literal and figurative meanings within a linguistic form. The focus of this study is on the theory of ambiguity within the realm of language semantics. Consequently, it can be inferred that ambiguity is a linguistic phenomenon that can manifest in various forms. The usage of specific words in particular contexts or conditions gives rise to different interpretations [10].

From the preceding statements, it can be deduced that recognizing the significance of semantics holds great importance for researchers. The comprehension of phrases heavily relies on the establishment of meanings. Various concerns arise when it comes to understanding meaning, with the connection between words being a prominent aspect to consider.

According to Crystal [6], ambiguity is a term employed in the field of linguistics to describe a word or statement that possesses multiple meanings, making it unclear. However, there are different types of ambiguity to consider. The most extensively examined form is grammatical or structural ambiguity.

According to Hurford and Heasley [11], when a word or sentence is open to interpretation, it can be understood in various ways. Ambiguity, a concept related to the flexibility of translation, allows for multiple meanings. Language relies on grammar to convey this information. Ambiguity arises when a word or phrase has more than one meaning and is characterized by systematic pairs of meanings.

A word or phrase is considered ambiguous when it has multiple interpretations. If a sentence contains two or more meanings that are not mutually exclusive, it is deemed ambiguous. Certain scholars of semantics adhere to a definition of a "sentence" that prohibits ambiguity. According to these scholars, a sentence holds significant coherence.

There are two distinct categories of ambiguity, as outlined by Ovu [12]: lexical ambiguity and syntactical ambiguity. Similarly, Hurfod and Heasley [11] provide further clarification by identifying the two types of ambiguities: syntactical ambiguity and lexical ambiguity. Lexical ambiguity, which encompasses both homonymy (unrelated sense) and polysemy (related sense), is a key component.

2.2 Previous Studies

In a study conducted by Khalifa [13], the aim was to examine the various forms of ambiguity—lexical, syntactic, and pragmatic—that compel readers to engage with headline news stories. The methodology involved distributing a questionnaire to 100 readers, with the objective of determining their ability to identify different types of ambiguity within 25 news headlines [14]. Additionally, the researcher investigated the psycholinguistic impact of these ambiguity types. Through the questionnaire, insights were gained into the readers' inclination to continue reading despite encountering ambiguous headlines. It was discovered that pragmatic ambiguity was the most easily comprehensible type from the readers' perspective. Furthermore, readers exhibited a greater tendency to read headlines with lexical ambiguity compared to other types.

The researcher failed to address the procedures implemented in the methodology, leaving a gap in this research. Additionally, the validity of the questionnaire was not mentioned by the researcher. Lastly, there was a deficiency of prior studies in the literature reviewed by her.

The findings of previous studies indicated that lexical ambiguity is more prevalent compared to other types of ambiguity. This current research provides a more comprehensive analysis, utilizing Kreidler's [4] classification to categorize different forms of ambiguity. Furthermore, the researcher employed a descriptive qualitative design as the methodology for this study, following the approach used by Taufiqoh [15].

Ambiguity, according to Fitri [16], falls under the classification outlined by Saeed [7] and Kreidler [4]. The methodology employed in this research mirrors that of Taufiqoh's 2017 study. The results of this research indicate that lexical ambiguity

is predominantly utilized and evident in news headlines. However, a notable shortcoming of this research is the complete omission of addressing the research questions. Furthermore, the organization of information in this study is lacking, and the researcher failed to incorporate previous studies.

Certain studies have demonstrated a failure to include an abstract, neglecting to provide crucial information. The researcher omitted any mention of the data analysis method employed. Additionally, the research questions were not addressed by the researcher [17].

The purpose of this study was to examine how readers respond to the ambiguity of language in cosmetic advertisements. However, the results of the study were inconclusive as the researcher did not provide sufficient discussion or presentation of the findings [18].

In order to identify ambiguities in the headlines of the Indonesian news website Jakarta Post and the American news website New York Times, this study employed descriptive qualitative methods. By utilizing Ullmann's theoretical framework (1977:156), it was determined that a total of 30 ambiguities were present in the headlines of both publications. Specifically, the Jakarta Post had 18 ambiguities, with 11 lexically ambiguous headlines and 7 grammatically ambiguous headlines. On the other hand, the New York Times had 12 ambiguous news headlines, consisting of 10 lexically ambiguous headlines and 2 grammatically ambiguous headlines [19].

In a descriptive qualitative study conducted by IRAWAN [20], an analysis was performed on The Jakarta Post articles to identify instances of ambiguity, specifically in the form of ambiguous words, phrases, and sentences. The study revealed the presence of two distinct types of ambiguity within the articles: lexical ambiguity and grammatical ambiguity. Among the data collected, 8 instances of lexical ambiguity were identified. Additionally, out of a total of 23 instances, 15 cases of grammatical ambiguity were observed [21].

3 Methodology of the Study

This chapter includes the methodology and the technique the researcher used in the study. Also, it shows the steps taken to accomplish the study's objectives. In addition to the instrument used to address the three main research questions:

1. What are the types of ambiguity?
2. What are the dominant types of ambiguity used in the headlines of CNN and BBC news?

For this study, a descriptive qualitative approach was employed. In order to address the research inquiries, news headlines were gathered from the online editions of BBC and CNN news. The data collection technique utilized the documentation method, which was chosen due to the fact that the data consisted of written sources.

In the process of data collection, the researcher adhered to a series of steps. Initially, the researcher conducted a comprehensive search of news headlines across

various fields. Subsequently, a specific headline was selected for analysis. The third step involved thoroughly reading the chosen headlines. Finally, the researcher identified and highlighted any words within the headlines that exhibited ambiguity.

3.1 Research Instrument

The researcher used books to understand the types of ambiguity. In addition she used dictionary as an instrument to support the data which are needed from the BBC and CNN ambiguous news headlines.

4 Data Analyses and Findings

4.1 Data Analysis

The researcher followed a systematic approach to analyze and interpret the data in a qualitative and descriptive manner. Firstly, she categorized the words and phrases in news headlines that displayed ambiguity. To ensure accuracy, she consulted the Longman dictionary to determine their meanings. Secondly, the researcher organized the identified words and phrases according to Kreidler's [4] theory, which classifies ambiguity into three types: lexical, syntactical, and referential. Lastly, she conducted a thorough analysis and interpretation of the words and phrases that exhibited ambiguous meanings.

Various types of ambiguity used in news headlines include:

1. Lexical ambiguity

   (a) Homonyms are unrelated senses of the same phonological word. The example of homonym found in CNN headlines:

   1."Record numbers of women are **running**, but how many can win?"

   Here the word running is ambiguous under homonyms type, because it can be interpreted into two unrelated senses. Based on Longman dictionary running means "the action or sport of running", "the activity of managing or operating something". So here the word running could mean both of them.

   (b) "It's time revisit Donald Trump's **battery** theory of life force"

   The battery means "a device that produces the electricity that makes it works" but in this case it means or refer to the weapon that Trump having. It consider ambiguous under homonyms because based on the text the meaning completely different.

   (c) "Treasury secretary Janet Yellen's words of inflation will not end America's price **hikes**." Here the word hikes if we referred to the Longman dictionary we will find that it has two different meaning. The first meaning is "a long

walk in the country" the second one "a large or sudden increase in prices, costs". So depending on the context that the word hikes used on it will refer to the second meaning.

(d) "I have learned how to **survive** with a bow and arrow."

Here this word identified lexical ambiguity. Referring to Longman dictionary it classified as homonymy and it has more than one interpretation. It means, "To continue to live after an accident", "to continue to live normally in spite of many problems". So, this sentence considers ambiguity, homonymy because it can consider as survive to live with family and also survive after near the death. Differ in meaning the same in phonological.

(e) "The titles are Frankfurt Motor Show: **Love**, hate, and electric cars"

The meaning of the term "love" is ambiguous. Because the meaning is different yet the phonological is the same in sound, it is characterized as lexical ambiguity as a homonym. The homophone and homograph of the word love are similar, but the meaning is different. The meaning of this word in Longman dictionary, "to have a strong feeling of affection for someone", "to care very much about someone" "to have a strong feeling of loyalty to your country or institution". The meaning of love here is ambiguous but we can guess that it refers or related to like something.

2. Polysemy: used when a word has distinct but related meanings. Here are some examples of polysemy found in CNN headlines:

(a) "Why our **fight** in Ukraine is yours too."

Here the part of speech for the word fight is verb; in this case it means a disagreement with something and to keep fighting for something. So, this is the suitable meaning because they want all of people fight with them and it comes in a verb situation. Different meaning share the same senses.

(b) "Washington University in St. Louis basketball **star** passes away from stomach cancer aged 22"

Based on the context the word star has the basic meaning as Noun. Referring to Longman dictionary means "a large ball of burning gas in space that we see as a point of light in the sky at night." But in this sentence the word star has the nearly meaning but in different way, it refers to a famous and excellent sports player.

(c) George Russell 'on a level playing **field'** with Lewis Hamilton at Mercedes"

Based on this sentence the word field considered polysemy which has different meaning depending on the context. In this context showed a competition. Referring to Longman dictionary it means, "An area of land used for the purpose", "An area of land used for playing a sport on."

(d) Jeremy Corbyn urges stronger **ties** with all EU nations"

The word ties here showed the literal meaning string. But also has different meaning but same sense, means strong connection, relation between organizations.

(e) A growing number of Americans are now learning hunting"

The word growing classified as polysemy because it refer or has multiple meaning and used in different context. The word growing can be taken as an increase in the number of Americans who are learning to hunt. In other cases, the connotation is different yet connected.

(f) Then corona virus **hit** at the start of last year"

The highlighted word hit has an ambiguous meaning, and because it has several meanings, it is characterized as lexical ambiguity in polysemy. The verb hit means "to touch something," whereas the noun hit means "bad effect on a person or thing." As a result, "corona virus touches something at the start of last year" and "corona virus has a negative effect at the start of last year" might be understood as "corona virus touches something at the start of last year." The second meaning, 'corona virus causes a negative effect that began last year,' is appropriate for the sentence given the context. As a result, the term hit is polysemy since it has several meanings and is employed in various contexts.

3. Syntactic ambiguity:

Sentences have more than one structure. Based on Kreidler theory it consists of:

(a) Surface Structure Ambiguity: the words cluster together in more different ways.

A coordinate head with one modifier: A coordinate head is made up of two words that are linked together by the conjunction 'and.' because there were some additions that changed before or after it, it will be unclear.

"Stop and search order issued after stabbing"

This sentence was ambiguous since it contained multiple possible sentence forms. It

will be bracket into:

([Stop and search] [order])

([stop order] and [search])

The firs bracket meant "stop and search" as the coordinate head with one modifier 'order. It means that stop and search order has many ways to deal with the stabbing. The second bracket contained that only modifying stop industry it was only stop that was order nor for search, it means that the stop order and thing refer to search has many ways to deal with the stabbing.

(b) A head with a coordinate modifier:

"Drinking two or more diet beverages a day linked to high risk of stroke, heart attacks".

Here in this sentence we have two modifier of one head:

(c) ([2] or [more diets])

(d) ([2 or more] [diets])

The first bracket indicated that consuming two or more diet beverages per day increased the risk of stroke and heart attack significantly. Then, the second bracket explained that two or more than three diet beverages a day will be at high risk of stroke, heart attacks (Table 1).

Table 1 The frequencies of types of lexical and syntactical ambiguity in the headlines presented in the table

No.	Types of ambiguity	Types of Lexical and Syntactical Ambiguity	Frequencies
1	Lexical ambiguity	Homonymy	5
		Polysemy	6
	Total of lexical ambiguity		11
2	Syntactic ambiguity	Surface structure ambiguity	2
	Total of syntactic ambiguity		2

5 The Findings

6 Discussion

Within this chapter, the researcher will delve into the discoveries made regarding the News headlines. The objective is to thoroughly examine each question and present the primary findings derived from the researcher's chosen approach. Through the course of the research, a total of 13 perplexing data headlines were identified from the BBC and CNN News. The data analysis revealed 11 instances of lexical ambiguity and 2 instances of syntactic ambiguity. Consequently, it can be concluded that lexical ambiguity is more prevalent than syntactic ambiguity. Discussion of the finding of research question:

1. What are the types of ambiguity?

As what the researcher discussed in the previous chapter, the types of ambiguity or the classification of ambiguity differ from each other depending on the theory that divided. In this research the types of ambiguity depending on the Kreidler's theory, he classify ambiguity into three types, lexical, syntactic and referential. In addition, that each type consists of sub types.

Lexical ambiguity consists of two sub types, homonymy and polysemy. Syntactic ambiguity consists of two sub types, surface structure ambiguity and deep structure ambiguity. The last type is referential ambiguity.

2. What are the dominant types of ambiguity used in the headlines of CNN and BBC news?

Depending on the findings the dominant type of ambiguity was lexical and the polysemy sub type it was the most frequency in the news headlines that found in BBC and CNN news.

- Lexical ambiguity: The findings show that the majority of the BBC and CNN news is ambiguous. The reader's interpretations are influenced by the words chosen in the headlines. The BBC and CNN news headlines contain a lot of multi-meaning terminology. As a result, the reader's misinterpretation is influenced by the reader's past knowledge of the word. Some data is characterized as polysemy because it

contains terms with the same core meaning yet appears in different contexts. The homonymous words were also discovered by the researcher. Because the words have different meanings but the same phonetic in another context, these data are characterized as homonymy.

- Syntactic ambiguity: The presence of syntactic ambiguity in the surface structure of sentences was identified by the researcher. This ambiguity arises when two words are coordinated by the conjunction 'and,' with a head and a modifier, resulting in unclear meanings. To accurately interpret a statement and avoid grammatical ambiguity, readers must consider the surrounding context. This contextual analysis is crucial when examining headlines that exhibit syntactic ambiguity, as the absence of punctuation can make it difficult for readers to determine the intended meaning. The study also revealed that certain variables can affect the comprehension of words and phrases, further contributing to syntactic uncertainty. Notably, the findings of this study align with and differ from previous research conducted by Fitri (2019), who explored lexical and syntactic ambiguity in CNN titles using the theories proposed by Saeed and Kreidler. Fitri's research identified four types of linguistic ambiguity: polysemy, homonymy, antonymy, and synonymy. During her investigation, she came across two distinct forms of syntactic ambiguity: surface structure and deep structure. The examination solely relied on Kreidler's theory from 1998, where the researcher identified two variations of lexical ambiguity in news headlines featured on BBC and CNN—specifically, homonymy and polysemy. Additionally, she encountered a single instance of syntactic ambiguity in the form of surface structure, involving a head with a coordinating modifier and a coordinating head with one modifier connected by the conjunction "and".

7 Conclusion and Recommendations

In the realm of communication, ambiguity arises when a word, phrase, or sentence can be understood in multiple ways, leaving the reader unsure of the intended meaning. This predicament commonly occurs in both spoken and written discourse. The perplexing nature of such news can leave readers bewildered about its true significance. When a text offers various possible interpretations, it has the potential to generate confusion among its readers.

Kreidler's method categorizes ambiguity into two distinct forms: lexical ambiguity and syntactical ambiguity. Lexical ambiguity arises when a single word can be interpreted in multiple ways, while syntactical ambiguity occurs when a phrase or sentence can be structured in different manners.

This research shows that there were 13 news headlines on BBC and CNN that had ambiguous meanings. The researcher founds that 11 headlines were lexically ambiguous, while 2 were syntactically ambiguous. They consist of two types of lexical ambiguity, namely polysemy and homonymy. The number of data found is 5 data of homonymy and 6 data of polysemy. Where the other 2 data is were

syntactically ambiguous under surface structure. Which occurs in two words that are coordinated by conjunction ‘and”, and A head with a coordinate modifier.

Based on the findings and discussion, the researcher identified two forms of ambiguities: lexical ambiguity and syntactical ambiguity. The researcher discovered that linguistic ambiguity dominated polysemy.

This study attempted to address the various viewpoints on using the ambiguity in news headlines. The researcher suggests to linguistics students to study the news headlines from other newspapers, other countries and other languages. In addition, they can study the books headlines and found the ambiguity in writing the headline for books.

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The Role of International Arbitration in Settling Disputes Involving Foreign Technology Companies



Yasar Alhiniti and Khalif Saleh Dhiab Amoush

Abstract The chapter at hand attempts to explore the function of international arbitration in the resolution of disputes related to foreign technology companies and host governments. The research takes into account a review of relevant legal and legislative literature concerning international arbitration and technology investment agreements to assess whether arbitration is effective as a preferred mechanism for resolving such disputes and whether it is efficient enough. It also looks into several cases filed under the International Centre for Settlement of Investment Disputes (ICSID) to help understand the different mechanisms through which arbitration can settle disputes but with speed and effectiveness, as well as confidentiality and neutrality. The results show that international arbitration is a fair and effective way to resolve conflicts between foreign technology companies and host countries, thus building trust and acting fairly. Moreover, the findings reflect that a considerable number of foreign investors in technology would choose arbitration rather than going through national courts because it is speedy, and confidential, plus it helps avoid the biases of national court.

Keywords International arbitration · Investment disputes · Foreign technology companies · Host countries · International Centre for settlement of investment disputes · Legal legislation · Investment agreements · Alternative dispute resolution methods · Confidentiality · Neutrality

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1 Introduction

When foreign companies conduct business abroad, they typically opt for international dispute resolution mechanisms to handle any conflicts that may arise with the host state. This preference stems from the belief that these mechanisms offer greater impartiality and autonomy compared to internal methods, which may not offer the necessary safeguards. Consequently, foreign companies are hesitant to invest unless they have confidence in the existence of an unbiased and independent judicial system that can be relied upon in the event of a dispute with the host state. This ensures the protection of their investments and the preservation of their rights [1].

In the pursuit of economic development and attracting investment, countries, particularly those in the developing world, often adopt a strategy of granting foreign operating companies the autonomy to select the governing law in case of conflicts instead of subjecting them to domestic courts. This research will explore the involvement of international and regional judicial bodies, such as the International Court of Justice, the Permanent Court of Arbitration, the Arab Investment Court, and international arbitration, in resolving investment disputes that involve foreign operating companies.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Assess the effectiveness of international arbitration as a means of resolving investment disputes between foreign companies and host countries.
- Understand the different types of arbitration and their impact on foreign investment disputes.
- Explore the importance of the International Center for the Settlement of Investment Disputes and its mechanism for resolving disputes between foreign investors and host countries.
- Specify the conditions and requirements necessary for the jurisdiction of the International Center for the Settlement of Investment Disputes in accordance with the World Bank Convention.
- Evaluate of the effectiveness of conciliation and arbitration procedures used by the International Center for the Settlement of Investment Disputes and their impact on improving the international investment climate.

1.2 Study Methodology

In order to examine the effectiveness of international arbitration in resolving investment disputes between foreign companies and host countries, this study employed the

descriptive-analytical approach. The analysis involved a thorough review of legal and legislative literature pertaining to international arbitration and investment treaties, with a specific emphasis on Jordanian law and Jordanian Arbitration Law No. (31) of (2001). Furthermore, practical cases were meticulously examined, including disputes involving Italian companies and the government of Jordan, to offer a comprehensive perspective on the various mechanisms and efficacy of international arbitration in the resolution of investment disputes.

2 The Role of the International Court of Justice in Resolving Disputes Related to Foreign Operating Companies

As the primary judicial body of the United Nations, the International Court of Justice (ICJ) operates in accordance with its Statute, which forms an essential part of its framework [2]. When it comes to resolving investment disputes, the Court's jurisdiction is restricted to disputes between states exclusively. Consequently, a foreign company engaged in business activities cannot directly approach the Court; instead, the only available option is to seek assistance from its home country through the principle of diplomatic protection. This principle is outlined in Article (34) of the Court's Statute, which specifies that "only states may participate in cases brought before the Court, provided they have accepted the Court's jurisdiction" [3].

Diplomatic protection encompasses the act of a state intervening to safeguard its citizens or their assets in another state, shielding them from potential harm caused by the actions taken by that state. This intervention is grounded in the legal principle that only entities recognized under international law have the authority to bring cases before international courts. The rationale behind this principle is that a foreign company conducting business in a host state may encounter violations of its rights and interests, yet lack the ability to seek protection and redress through the domestic legal avenues available in that state [3]. There are several essential conditions that must be met to bring a case before the International Court of Justice based on the principle of diplomatic protection:

1. In order for a foreign operating company to seek protection from a host state, there must be a legal connection between the two entities, often referred to as the nationality link. The state in which the foreign operating company holds nationality has the authority to bring a case before the International Court of Justice, exercising the right to safeguard the interests and rights of its nationals through a "diplomatic protection claim" [4].

The principle of the nationality link between a state and an individual as the sole basis for diplomatic protection was affirmed by the International Court of Justice in its judgment on February 28, 1939, in the case of "Panevezys-Saldutiskis" Railways, as stated: "In the absence of any treaty or agreement to the contrary, the state's

exercise of diplomatic protection is solely based on the nationality connection" [5]. The determination of corporate nationality varies depending on the criteria applied by states. Some states apply the control criterion, which considers the company to be under the control and direction of its founders and partners, aligned with their interests and objectives. Other states apply the incorporation or formation criterion, where the company acquires the nationality of the state in which its incorporation contract is signed. Lastly, there is the criterion of the actual principal place of management, where the company obtains the nationality of the state where its main management, legal, and operational center is located [6].

The International Court of Justice's position on determining corporate nationality for diplomatic protection purposes is clearly demonstrated in its February 5, 1970 judgment in the "Barcelona Traction" case between Spain and Belgium. In this case, the Court adopted the criteria of incorporation and place of management, affirming that a state has the right to provide diplomatic protection to a legal entity if it is established in accordance with the laws of that state and has its place of management within its territory [6].

1. In order to maintain amicable relations between nations and prevent conflicts, the foreign operating company is required to exhaust all available methods of resolving disputes within the host state's legal framework before seeking recourse from its own government and initiating a diplomatic protection claim at the International Court of Justice. It is necessary for the foreign operating company to make every effort to resolve the harm it has experienced in accordance with the laws of the host state before pursuing alternative avenues for resolution [7].
2. According to the ruling in the "Panevezys-Saldutiskis" Railways case on February 28, 1939, by the International Court of Justice, it is established that the foreign operating company seeking diplomatic protection cannot be held responsible for the harm it has suffered. Instead, the harm must be attributed to the host state. The company is obligated to adhere to the laws of the host state, including fulfilling tax obligations and accurately representing its nationality. The court affirmed this principle and rejected the Estonian government's claim, acknowledging Lithuania's valid objection regarding the failure to exhaust local remedies [8].

According to the researcher, there are challenges and barriers to the jurisdiction of the International Court of Justice. A foreign company operating internationally cannot directly seek its intervention, but instead must go through the state that provides its protection. However, this state may choose not to file a claim in order to preserve economic and political ties with the host country. Furthermore, the frequent exercise of this right may clash with a state's sovereignty over activities conducted within its borders, potentially resulting in political conflicts between the host country and the foreign company's home state.

3 The Role of the Permanent Court of Arbitration in Resolving Disputes Involving Foreign Operating Companies

Originally, the Permanent Court of Arbitration (PCA) was designated to settle investment disputes between contracting states. However, it was later allowed for individuals to directly resort to it under the following conditions:

1. For a foreign operating company to appear before this court, both the state of which the company is a national and the host state must be parties to the relevant agreement.
2. All disputing parties must agree to refer the dispute to the court, as it is a non-mandatory tribunal [9].

One of the investment disputes that has been resolved by the PCA is case No. 17/2011. This particular case involved American company Juar Akashi and UK company Ro Re Lak PLC, who filed a complaint against Bolivia regarding the expropriation of a power generation company. The dispute was brought before the PCA and conducted in accordance with the UNCITRAL Arbitration Rules 2010. The arbitration was based on the bilateral treaties between the United States and the Government of the Republic of Bolivia, as well as between the United Kingdom and Northern Ireland. The final decision, issued on January 31, 2014 [10], concluded the case.

The voluntary acceptance of the PCA by all parties involved is a notable aspect, as it ensures that the decisions made by the tribunal are obligatory and cannot be rejected. It is important to note, however, that there are no mechanisms in place to enforce these decisions. Nevertheless, the establishment of the PCA marks a significant leap forward in offering an international avenue for resolving conflicts between nations and foreign investment firms [11].

4 The Role of the Arab Investment Court in Resolving Disputes Involving Foreign Operating Companies

The jurisdiction of the court, as outlined in Articles (29, 30, 36) of the Unified Agreement for the Investment of Arab Capital, is divided into two categories: judicial and advisory. The court's judicial jurisdiction is defined in Articles (29, 30), which specify the subject matter and the parties who have the right to approach the court. In terms of subject matter, the court is competent to adjudicate the following disputes:

1. Disputes related to the application of the provisions of the agreement or arising from it.
2. Disputes involving foreign operating companies if the parties agree to refer them to the Arab Investment Court. Even if there is a prior agreement to submit these disputes to arbitration or international courts, if a case has been brought before one of these forums, it cannot be brought before the other [12].

In terms of the parties involved, the court possesses the necessary jurisdiction to resolve investment disputes between the host state and the foreign operating company if the host state is a party to the agreement. Similarly, the court has jurisdiction over disputes between the foreign operating company and the state of its nationality if that state is a party to the agreement. Additionally, Article (36) of the agreement outlines the court's advisory jurisdiction, stating that it may provide advisory opinions on any legal matter within its jurisdiction upon request from a contracting state, the Secretary-General of the Arab League, or the Council. This demonstrates that the court also serves in an advisory capacity, although these opinions are not binding and are only issued in response to requests from the involved parties, the Secretary-General of the Arab League, or the Economic and Social Council of the League [13].

The court's jurisdiction is defined by its obligatory essence, granting the ability to unilaterally bring a dispute before the court. Article (29/1) of the agreement explicitly outlines this: "The court has the authority to settle disputes referred to it by one party to the investment, pertaining to the implementation or arising from the provisions of the agreement." Consequently, an Arab investor has the freedom to directly approach the court individually, bypassing their home country, in order to resolve conflicts with the host nation. This sets the court apart from the International Court of Justice.

In addition, as per the agreement, Article (31) provides the foreign operating company with the liberty to initiate legal action either in the national court or the Arab Investment Court, but not both at the same time. The article explicitly states, "A Middle Eastern investor has the option to seek redress in the courts of the host country, in accordance with their jurisdictional regulations. However, once the investor files a claim in one forum, they are prohibited from pursuing the same claim in the other".

In a lawsuit brought by the President of the Contractors Union against the General Secretariat of the Arab League, seeking the liquidation of the company's rights in the project to establish the Arab League headquarters in Tunisia, the Arab Investment Court established its jurisdiction and set the rules in case No. 7/1 on 6/2/2010. However, the court ultimately dismissed the case on the grounds of lack of jurisdiction, as the Arab League Secretariat did not meet the criteria for being considered a state according to the unified agreement. Similarly, in case No. 4/2 (request) on 21/8/2007, the court ruled that each state party to the agreement has the right to take necessary measures to protect its security, as it is an internal matter not within the jurisdiction of the court [13].

Once the court has rendered its rulings, they become legally binding and cannot be appealed. The party that emerges victorious can enforce the judgment by seeking the court's assistance, just like they would with any other national judgment. However, there is a possibility for the court to reconsider its decision if it goes against a fundamental rule of the agreement or procedural rules, or if there is a crucial fact that was previously unknown to both the court and the party requesting reconsideration. It is important to note that this request for reconsideration will only be accepted if the lack of knowledge was not a result of negligence.

It is worth highlighting that Article (25) of the agreement specifically outlines the various methods for resolving disputes between foreign operating companies

and the host state, including conciliation, arbitration, or recourse to the Arab Investment Court. The researcher posits that the Arab Investment Court sets itself apart from the International Court of Justice and the Permanent Court of Arbitration by establishing an independent judicial body with its own legal framework. The court's decisions are not only binding and final, but also immediately enforceable within the state against which the judgment is rendered, akin to a ruling from its domestic judiciary. The legal provisions are unambiguous and precise, leaving no room for circumvention by the disputing parties. Moreover, the court offers multiple avenues for resolving investment disputes among member states, starting with conciliation, followed by arbitration, and ultimately resorting to the court. Unlike the International Court of Justice, the Arab Investment Court allows direct access for investors, thereby fostering and promoting investment within Arab nations, consequently bolstering the economy in the Arab world. However, it is important to note that the court's jurisdiction is currently limited to investment disputes solely involving Arab states, which necessitates a reevaluation to expand its jurisdiction to encompass disputes where one party is Arab, regardless of the nationality of the other party.

5 International Arbitration

In their quest for effective and impartial solutions to investment disputes, international corporations are actively exploring alternative avenues. Among the array of options available, arbitration stands out as a highly significant and pragmatic approach to resolving conflicts arising from foreign investment contracts. Foreign companies often favor arbitration over the national court system, which they regard with skepticism and doubt. This preference is further reinforced by the expeditious nature and confidential nature of arbitration, qualities that seamlessly align with the essence of investment agreements.

When disputes arise between foreign companies and the host state, national courts typically have primary jurisdiction. However, arbitration serves as a notable exception to this general principle. States recognize the importance of attracting foreign companies to bolster their economic growth and strengthen their resources. As a result, they actively create legislation that fosters a favorable environment, instilling confidence in these companies and helping them achieve their objectives.

To address the significance of arbitration in settling disputes that involve international companies, various jurisdictions have implemented legislation to govern arbitration proceedings. One such jurisdiction is Jordan, which has established regulations for arbitration through the enactment of the Jordanian Arbitration Law No. (31) of 2001.

Arbitration comes in various forms that a foreign company can utilize, including:

- **Institutional Arbitration:** This involves an agreement between the foreign company and the other disputing parties to refer their disputes to specialized institutions, bodies, and centers in the field of arbitration according to the rules

and regulations governing these entities, which outline the arbitration process and decision-making procedures [14].

- **Ad-hoc Arbitration:** This refers to an agreement between the foreign company and the other disputing parties to submit their disputes to arbitration based on the parties' free will.
- **Mandatory Arbitration:** This is arbitration that the disputing parties cannot choose but is mandated by law as a method for resolving disputes in specific matters, such as labor disputes [15].
- **Domestic Arbitration:** This type of arbitration is conducted according to the domestic law of the disputing parties, meaning all parties involved are from the same country.
- **International Arbitration:** This involves parties from different countries, each with its legal system, and arises from commercial relations or external interests [14].

Ad-hoc arbitration is regarded by the researcher as the optimal form of arbitration due to its foundation in the voluntary agreement of the involved parties. This voluntary nature ensures that the awards issued are willingly executed by all parties involved. The researcher has also delved into various forms of arbitration, with a particular focus on institutional arbitration. This type of arbitration is conducted through specialized organizations and bodies, such as the International Centre for Settlement of Investment Disputes (ICSID). The ICSID holds a prominent position in the resolution of disputes arising from investment contracts between foreign investors and host states. Through the processes of conciliation and arbitration, the ICSID aims to facilitate the attainment of an arbitral award. These discussions have sparked the researcher's curiosity to further explore the workings of the ICSID.

5.1 International Centre for Settlement of Investment Disputes

On July 14, 1972, Jordan became a member of the International Centre for Settlement of Investment Disputes (ICSID). In instances where foreign investors and Jordanian government institutions find themselves in conflict, Jordan has chosen to refer several cases to ICSID for resolution. One such case involved two Italian companies and the Jordanian government, with the companies seeking financial compensation for their involvement in the Unity Dam project. However, the tribunal of ICSID unanimously dismissed the claim made by the Italian companies [16].

According to Article (25/1) of the ICSID Convention, the establishment of the center's jurisdiction is contingent upon certain conditions. The article specifies that the center has jurisdiction over any legal dispute that directly stems from an investment between a Contracting State, its designated subdivisions or agencies, and a national of another Contracting State. However, for the center to have jurisdiction, both parties involved in the dispute must provide written consent to submit the dispute

to the center. It is important to note that once consent is given, it cannot be unilaterally withdrawn [17]. The conditions are as follows:

- **The Dispute Must Be Legal and Related to the Foreign Company and Host State**: The jurisdiction of the center is limited to disputes that fall within the scope of Article (25/1) of the Convention. These disputes must have a legal basis and be linked to a right or legal obligation outlined in the investment contract or an infringement upon a right established in an investment agreement between the foreign company and the host state [17]. It is important to note that political disputes are not within the purview of the center. Furthermore, for a dispute to be eligible, it must directly stem from the investment contract, indicating a clear connection between the dispute and a specific investment.
- **The Host State Must Be a Contracting State and the Other Party Must Be a Foreign Company from Another Contracting State**: In order for the jurisdiction of ICSID to be applicable, one of the parties involved in the dispute must be a contracting state or an administrative entity of a contracting state, while the other party must be a foreign company from another contracting state.
- **Consent of the Parties to the Dispute:** In order for the jurisdiction of the center to be established, both the host state and the foreign company must mutually agree. The ICSID Convention grants this jurisdiction on a voluntary basis, allowing states the freedom to either accept or decline the referral of their disputes with foreign companies to the center. Likewise, the foreign company also possesses complete autonomy in this matter, and the jurisdiction of ICSID is only secured when both parties provide written consent [18].

By agreeing to submit the disagreement to ICSID, all other methods of resolving the issue are automatically excluded, unless there is a separate agreement stating otherwise. Nevertheless, any party involved has the right to demand the completion of administrative and legal procedures as a prerequisite for consenting to arbitration at the center, as stated in Article (26) of the Convention [19].

Certain nations may seek to evade arbitration with international corporations by asserting their sovereignty and relying on diplomatic protection, potentially impacting the outcome of the arbitration. Nevertheless, the ICSID Convention addresses this issue by prohibiting states from invoking diplomatic protection in disputes that are submitted to ICSID arbitration, as stated in Article (27/1) of the Convention. However, there is a solitary exception that permits a state to invoke diplomatic protection if the opposing state fails to resolve the dispute or enforce the ICSID award [20].

The tasks of the Centre in regards to dispute resolution are outlined in Paragraph 2 of Article 1 of the ICSID Convention. According to this provision, the Centre's primary objective is to offer facilities for the conciliation and arbitration of investment disputes between Contracting States and nationals of other Contracting States. It is evident from this passage that the Centre's responsibilities are restricted to two main functions: conciliation and arbitration.

1. **Conciliation:** In an effort to find a peaceful resolution to investment conflicts between the host country and the foreign corporation, there is an international convention that focuses on conciliation. This convention is outlined in Chapter Three, Articles (28–35), which are further divided into three sections. The initial section covers the process of requesting conciliation, followed by the formation of the conciliation commission in the second section, and concludes with an explanation of the conciliation procedures in the third section [21, 22].

To initiate the process of conciliation, either the host state or the foreign company must submit a written request to the Secretary-General of the Centre. The Secretary-General then notifies the other party. Upon reviewing the request, the Secretary-General proceeds to register it if it meets the Centre's jurisdictional criteria [23–25].

Upon submission of the request, the formation of the conciliation commission takes place, which includes either a single conciliator or an uneven number of conciliators, as determined by the parties involved. In the event of disagreement, a three-member commission is established, with each party selecting one conciliator, while the third conciliator, who assumes the role of chairperson, is chosen through mutual consent. Failure to establish the commission within ninety days from the registration date prompts the President of the International Centre to appoint the remaining conciliator(s) [21].

In accordance with the Convention, the conciliation procedures operate under the principle of competence-competence as outlined in Article (32), Paragraph 1. This principle grants the Commission the authority to determine its own competence and address any objections raised by the parties regarding its jurisdiction or other grounds. Unless otherwise agreed upon, the conciliation procedures adhere to the rules in effect at the time of the agreement. Any procedural matters not covered by the Convention or the parties' agreement will be resolved by the Commission at its discretion. In the event that the Commission foresees a lack of agreement between the parties, it has the option to terminate the procedures and prepare a report detailing the reasons for the failure to reach an agreement [20].

1. **Arbitration:** Chapter Four of the Convention is exclusively devoted to the topic of arbitration, encompassing six sections and consisting of Articles (36–55). The initial section deals with the process of initiating arbitration, which entails the submission of a written request to the Secretary. Subsequently, the Secretary forwards a copy of the request to the opposing party. It is imperative that the request contains the consent of both parties to engage in the arbitration process. The Secretary is responsible for the registration of the claim, provided that it falls within the jurisdiction of the Centre. In the event that the claim falls outside the Centre's jurisdiction, the Secretary possesses the authority to either approve or reject the registration [20].

Upon the registration of a claim, the formation of an arbitration tribunal takes place. The tribunal is comprised of either a single arbitrator or an odd number of arbitrators, as determined by the parties involved. In the event that the parties are unable to reach an agreement regarding the number and appointment of arbitrators,

a tribunal of three arbitrators is established. Each party selects one arbitrator, while the third arbitrator, who also serves as the tribunal's chairperson, is chosen through mutual consent. If the tribunal is not constituted within ninety days of the claim's registration, the President of the Centre will appoint the arbitrator(s), ensuring that they are not citizens of the disputing countries or the foreign investor's home nation [21].

Article (41/1) of the Convention affirms the principle of competence-competence in relation to the powers and functions of the tribunal, stating that "The Tribunal determines its own competence. " Furthermore, paragraph 2 of this article specifically grants the tribunal the authority to address any objections raised by either party concerning the jurisdiction of the Centre or any other grounds [22, 26, 27].

In accordance with the Convention, the Tribunal is required to adhere to the arbitration procedures specified in the agreement, unless the parties have mutually agreed otherwise. It covers matters such as the non-participation of a party or failure to present claims, explicitly stating that such circumstances do not grant any rights to the other party. Additionally, if deemed necessary, the Tribunal has the authority to implement provisional measures to safeguard the rights of both parties [23].

The Convention's articles (48, 49) pertain to the awards rendered by the Tribunal. These articles specify that decisions are reached through a majority vote and must be documented in a written form, endorsed by all Tribunal members in favor of the decision. Additionally, the publication of the Tribunal's award necessitates the consent of both parties involved [24, 28–30].

In addition, the Convention addresses matters pertaining to the interpretation, review, and nullification of the award issued by the Tribunal, providing provisions for the establishment of a fresh tribunal to examine the dispute in case the initial tribunal is incapable of doing so [20]. In certain cases, the Convention permits the annulment of the Tribunal's award upon request from one of the parties if there was [31]:

- An error in the formation of the tribunal [32, 33].
- Exceeding the tribunal's jurisdiction [34, 35].
- The disqualification of a tribunal member [36, 37].
- Serious neglect of procedural requirements [38, 39].
- Failure to state the reasons for the award [40, 41].

When such situations arise, a dedicated committee consisting of three members and arbitrators is assigned to review the request. It is ensured that none of the original arbitrators are involved in this process, and none of the committee members belong to the nationality of the disputing parties. Additionally, the Tribunal holds the authority to postpone or suspend the implementation of the award until a final decision is reached, if deemed necessary [20].

Within the concluding portion, the Convention focuses on the acknowledgment and implementation of awards, deeming the Tribunal's decision binding for both parties and requiring them to carry out its execution as if it were a verdict issued by a domestic court [21].

6 Conclusion

To summarize, international arbitration serves as a successful and impartial means of settling conflicts between foreign corporations and host nations, ultimately promoting trust and equity in investment partnerships. The various arbitration options provide flexibility for foreign companies to select the most appropriate approach to efficiently and privately resolve disputes. The International Centre for Settlement of Investment Disputes (ICSID) plays a crucial role in maintaining stability and instilling confidence in the investment landscape, thereby increasing the appeal of countries to foreign investors and fostering the inflow of foreign investments.

6.1 Findings

1. International arbitration is an effective and neutral means of resolving investment disputes between foreign companies and host countries, building trust between the parties and ensuring fairness.
2. Many foreign investors choose arbitration as an alternative to domestic court procedures because of its speed and confidentiality, and to avoid potential bias by domestic courts.
3. Various forms of arbitration are available for foreign companies, including institutional, ad hoc, compulsory, domestic and international, offering flexibility in choosing the most appropriate method for each dispute.
4. The international centre for the settlement of investment disputes (ICSID) plays a key role in resolving disputes related to investment contracts between foreign investors and host countries, increasing the stability of the investment environment.
5. The jurisdiction of the ICSID is determined based on the conditions set out in Art. (25/1) of the International Banking Agreement, ensuring transparency of the rules governing the activities of the Centre.
6. ICSID's conciliation and arbitration procedures contribute to the effective resolution of disputes, thereby improving the international investment climate and providing legal safeguards for investors.

6.2 Recommendations

1. Raising awareness of the importance of international arbitration as an effective means of resolving investment disputes between foreign companies and host countries.
2. Encourage countries to develop their local legislation to ensure a favourable legal environment for attracting foreign investment.

3. Strengthen the role of the International Centre for the Settlement of Investment Disputes (ICSID) by clarifying and facilitating access to conciliation and arbitration procedures.
4. Ensure the availability of clear and transparent information on institutional and ad hoc arbitration procedures to support foreign companies in making informed decisions.
5. Encourage foreign companies to choose ad hoc arbitration to ensure disputes are resolved amicably and quickly.
6. Providing training programs for judges and arbitrators to increase their understanding of international arbitration procedures and improve their competence in resolving investment disputes.
7. Encouraging contracting states to engage in the implementation of ICSID arbitration awards to ensure the protection of the rights of foreign investors and strengthen confidence in the international judicial system.

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Beyond Password's: Context Aware Behavioral Biometrics for Continuous Authentication



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Abstract Amidst the rising tide of cyber threats, traditional static authentication methods, encompassing passwords and unvarying biometrics, lay bare their vulnerabilities. Their proneness to breaches and inability to ensure seamless user experiences illuminate the pressing demand for innovative strategies. Unlike static authentication, which verifies users solely at the outset of a session, continuous authentication operates in real time, actively monitoring users throughout their interactions. Unveiling a paradigm shift in authentication: "Beyond Passwords: Context-Aware Behavioral Biometrics for Continuous Authentication." This research introduces an innovative framework that intricately intertwines user behavioral patterns with dynamic contextual cues, propelling authentication to new frontiers. By seamlessly harmonizing behavioral biometrics within the fabric of real- time context, the framework not only fortifies security but also enriches seamless user experience. This study's contribution lies in its novel approach, bridging gaps in authentication paradigms and forging a comprehensive user verification model that redefines the synergy between behavior and context. The framework's adaptability to diverse user behaviors, its robustness in detecting anomalies, and its incorporation of privacy-preserving practices stand as pillars that solidify its role as the torchbearer of the future of authentication.

Keywords Context-aware · Behavioral biometrics · Continuous authentication · Technological progress

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1 Introduction

Authentication is the process of verifying a user or device before allowing access to a system or resources. Authentication serves as the foundational layer, ensuring that only authorized entities gain access to valuable information and systems. It is the process through which the legitimacy of users or entities is verified, forming a crucial defense against unauthorized access. Traditional authentication methods/models encompass diverse models, each with distinct attributes and accompanying vulnerabilities (Fig. 1).

KBA uses passwords and security questions but is vulnerable to breaches and memory issues [2]. Possession-based methods involve physical tokens or devices, with risks of loss [2]. Biometric authentication offers accuracy but may face usability and spoofing issues [2]. Context-based authentication adapts to location and time but has limited scope [3]. Behavior-based authentication monitors patterns like keystrokes, requiring extensive data and risking false positives [4] (Table 1).

This research highlights the limitations of traditional authentication methods, such as password vulnerabilities, privacy concerns with biometrics, and the challenges of context and behavior-based approaches. These issues underscore the need for a more adaptive authentication model. The study proposes integrating context-aware and behavior-based authentication to create a more resilient and responsive security framework. By combining behavioral biometrics with real-time contextual cues, the framework aims to enhance security while maintaining a seamless user experience. The research seeks to answer how this integration can create a robust and continuous authentication model, ultimately reshaping digital identity verification.

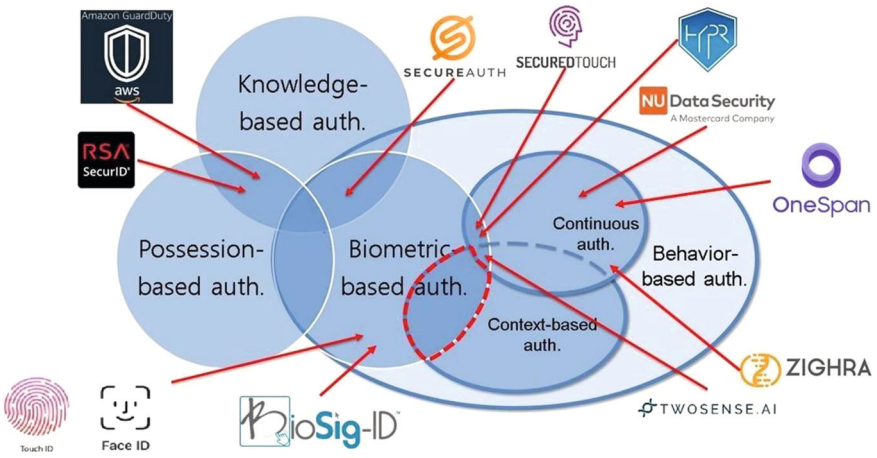


Fig. 1 Commercial authentication models [1]

Table 1 Comparison of commercially available authentication models

Solution	Authentication method	Used sensors	On-device solution	Behavioural profile- update	Used modalities	Transparent (passwordless) authentication	Context aware
RSA SecurID	Multifactor	N/A	No	No	PIN, hardware key	No	No
GuardDuty	Multifactor	GPS, wireless adapters	No	Yes	Apps usage, geolocation, wireless connections	No	No
SecureAuth	Multifactor	Motion sensor, touchscreen, wireless adapters	Yes	No	Apps usage, keystroke dynamics, wireless connections	Yes	Yes
SecuredTouch	Behaviour-based	Motion sensor, touchscreen, wireless adapters	Yes	Yes	Apps usage, keystroke dynamics, wireless connections	No	No
HYPR	Multifactor	Motion sensor, touchscreen, wireless adapters	Yes	No	Apps usage, keystroke dynamics, wireless connections	Yes	No
FaceID, TouchID	Biometric	Fingerprint sensor, frontal camera	Yes	No	Fingerprint, facial recognition	No	No
MasterCard NaData	Behaviour-based	Motion sensor, touchscreen, GPS, wireless adapters	No	No	Apps usage, geolocation, keystroke dynamics, device tilts, wireless connections	Yes	No
TwoSense.AI	Continuous and multifactor	Motion sensor, touchscreen, front-facing camera, GPS	No	No	Touchscreen, apps usage, keystroke dynamics, geolocation, gaits	Yes	No
Bio-Sig ID	Multifactor	Touchscreen	No	No	PIN or password, gestures on a touchscreen	No	No

(continued)

Table 1 (continued)

Solution	Authentication method	Used sensors	On-device solution	Behavioural profile- update	Used modalities	Transparent (passwordless) authentication	Context aware
OneSpan	Multifactor	Motion sensor, touchscreen, front-facing camera	Yes	No	Apps usage, keystroke dynamics, wireless connections	Yes	Yes
Zighra	Continous and multifactor	Motion sensor, touchscreen	Yes	No	Apps usage, keystroke dynamics, wireless connections	Yes	No

1.1 Problem Definition

In the intricate realm of the digital age, there exists a compelling need for authentication methods that surpass the vulnerabilities inherent in conventional means, notably passwords and static biometrics. This necessity is more critical than ever, given the evolving threat landscape. Despite the substantial potential offered by context-aware and behavioral biometrics authentication models, a prevailing issue persists—they frequently operate in isolation. This fragmentation introduces formidable challenges when endeavoring to establish a comprehensive and resilient user verification system.

1. Single Point of Failure: Passwords

Passwords, traditionally a cornerstone of authentication, stand as a significant technical vulnerability. Susceptible to brute force attacks, phishing, and social engineering, they represent a single point of failure. The technical inadequacy of passwords (Table 2) necessitates an advanced, multi-layered approach that moves beyond reliance on this insecure credential [5].

Traditional Password-Based Authentication (Fig. 2).

2. Context-Aware and Behavioral Biometrics Integration: A Technical Challenge

Table 2 Authentication methods comparison

Authentication method	Limitations	Possible attacks
Traditional password-based authentication	• Vulnerable to password guessing, phishing • Passwords can be forgotten or shared • Limited security against advanced attacks • Limited to session start, no continuous monitoring	• Brute force attacks • Phishing scams • Credential sharing • Dictionary attacks • Session hijacking • Replay attacks • Unauthorized access after initial authentication
Multifactor authentication (MFA)	• Potential user friction, devices needed • Complexity may introduce user experience challenges • Cost and Implementation Challenges • Limited to session start, no continuous monitoring	• Device theft or loss • Social engineering • Biometric spoofing (e.g., Fingerprints or face recognition) • Token Interception • Session hijacking • Replay attacks • Unauthorized access after initial authentication
Physical Biometrics	• Privacy concerns, potential for spoofing • Limited scalability, high implementation costs • Security risks if biometric data is compromised	• Biometric spoofing (e.g., Fingerprint replication) • Database breaches • Physical attacks on biometric sensors

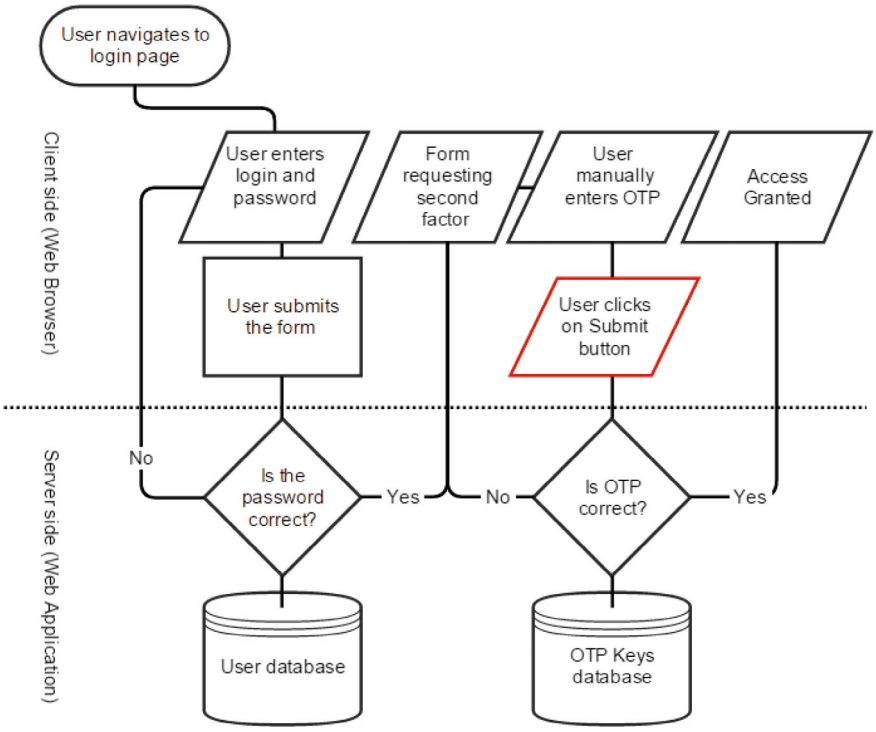


Fig. 2 Traditional password based authentication model [6]

While context-awareness (Fig. 3) and behavioral biometrics (Fig. 4) offer advancements, their standalone deployment presents formidable technical challenges. Context-awareness, considering factors like device type and location, and behavioral biometrics, encompassing keystroke dynamics, achieve optimal efficacy when seamlessly integrated. The technical challenge lies in harmonizing these components within a continuous authentication framework, creating a unified defense against evolving threats (Table 3).

3. Need for Change: A Real-Time Example

The evolving threat landscape demands a technical renaissance in authentication methods, underscored by a tangible example. The Equifax data breach in 2017 laid bare the technical vulnerabilities of traditional authentication. Exploiting the static nature of passwords, cybercriminals orchestrated a breach documented in the "Equifax Data Breach: A Technical Analysis" [9] paper. This breach serves as a stark illustration of how relying solely on passwords, a single point of failure, exposes vulnerabilities to sophisticated attacks. The exploitation of weak authentication measures resulted in unauthorized access to a treasure trove of personal data. This case study reinforces the urgency for an evolution in authentication, advocating for

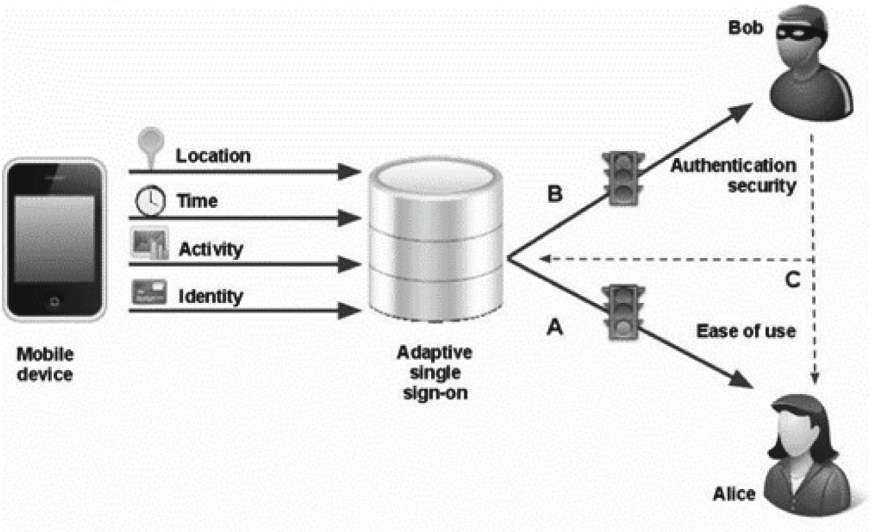


Fig. 3 Context aware authentication [7]

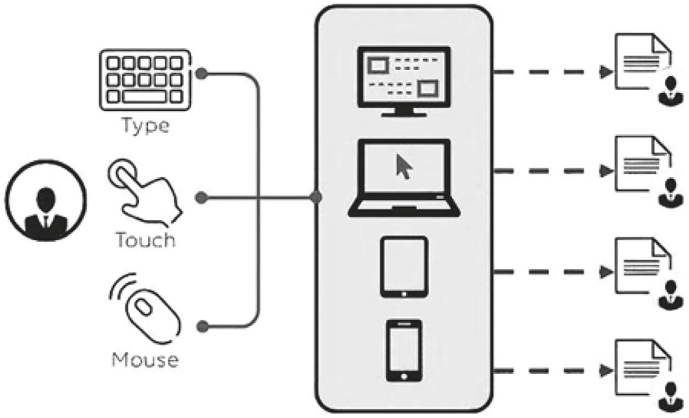


Fig. 4 Behavior based authentication [8]

a shift towards advanced, integrated Context-Aware Behavioral Biometrics methods that proactively respond to the dynamic cybersecurity landscape (Table 4).

Table 3 Context aware and behavioural biometrics

Authentication method	Limitations	Possible attacks
Behavioral biometrics	• Can be impersonated, limited accuracy • Sensitivity to environmental changes • Training challenges, varied user behaviors	• Mimicking user behavior • Environmental noise impact • Behavioral biometric spoofing (e.g., Keystroke mimicry)
Context-aware authentication	• Dependency on contextual factors, false positives • Inaccuracies in dynamic environments • Potential user privacy concerns	- False positives in unusual contexts • Exploiting dynamic environment changes • Context injection attacks

Table 4 Context aware behavioral biometrics

Authentication method	Limitations	Possible attacks
Context-aware behavioral biometrics	• Requires robust training • User privacy concerns • Battery drain	• Adversarial attacks on training data • Manipulating behavioral patterns • False positives due to rapid context changes

1.2 Aim/Objective

This research focuses on integrating context-aware and behavioral biometrics for user authentication to address vulnerabilities in traditional methods like passwords and static biometrics. The goal is to develop an adaptive authentication framework that enhances robustness, privacy, and energy efficiency. The study examines the integration of these models, explores limitations, privacy issues, and hardware constraints, and aims to provide insights into their combined effectiveness in strengthening user verification systems.

Main Research Question(s).
Why Change?
Why Combine Context and Behavior?
What Verification Layers?
Beyond Security?

2 Existing Work

Researchers such as Mondal et al. [10], Shaji et al. [11], and Bo et al. [12] have advanced touch-based behavioral biometrics for enhanced device security through unique touch patterns. Deutschmann et al. [13] improved authentication precision with multimodal behavioral biometrics, while Alshehri et al. [14, 15] expanded keyboard usage to continuous text authentication. Privacy-preserving strategies by Prakash and Singaravel [16] and Samangouei et al. [17] integrate hard and soft biometrics but face challenges with distinctiveness and permanence. Context-aware authentication by Hayashi et al. [18] and Witte et al. [19, 20] emphasizes contextual insights. Despite these advancements, integrating context-awareness and behavioral biometrics remains complex. This research aims to propose an innovative context-aware model that combines both domains for a comprehensive authentication solution [21–26, 31–33].

3 Methodology

See Fig. 5

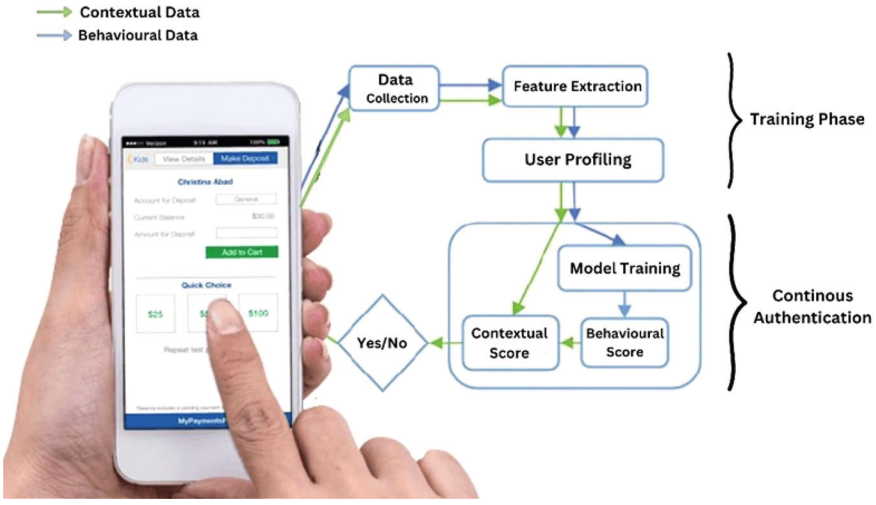


Fig. 5 Our context aware behavioural biometrics methodology

3.1 Training Phase

1. Contextual Data Extraction

Context-Awareness Authentication (CAA) enhances traditional security by integrating factors like user identity, resource requests, timing, location, and purpose into access control decisions. Unlike static methods that often disrupt user experience, CAA uses dynamic, context-driven assessments to balance security and usability. By leveraging machine learning and real-time risk analysis, CAA can better detect anomalies and mitigate risks, as demonstrated in the Edward Snowden case. CAA considers four types of contextual data:

- Computing Context: Device and network-related data.
- User Context: User-specific data such as preferences and location.
- Physical Context: Data about the physical environment.
- Time Context: Temporal factors like time of day and date.

Data gathering of these following attributes can be obtained via Table 5.

2. Behavioral Data Extraction

Behavioral Biometrics Authentication (BAA) enhances identity verification by analyzing unique behavioral patterns:

Gait Analysis: Uses motion sensors to capture walking patterns.

Gesture Recognition: Analyzes touch interactions on devices.

Motion Dynamics: Combines gait and gesture data.

Voice Biometrics: Examines voice characteristics.

Keystroke Dynamics: Monitors typing patterns.

Data is collected via sensors and stored in formats like CSV or JSON, with encryption and anonymization to ensure privacy (Table 6; Fig. 6).

3.2 User Profiling

User profiling is a critical process that systematically captures individual behaviors, preferences, and contextual attributes. By collecting and analyzing diverse data points, it helps identify customary user conduct and promptly detect anomalies to mitigate potential security threats. The attributes within user profiles vary widely depending on the organization or application, reflecting the specific scenarios and the importance assigned to certain features. For instance, a company might prioritize gait analysis in its user profiling, tailoring profiles to meet unique security and operational needs. The adaptability of user profiling is enhanced through the integration of various machine learning models, which, when combined effectively, create

Table 5 Contextual data

Context type	Captured contextual information	Available sensors and technologies
Location	Precise GPS coordinates, Wi-Fi network details, bluetooth proximity	GPS receivers, Wi-Fi positioning, bluetooth low energy (BLE)
Network environment	Network type, latency, bandwidth, IP address	Network API, ping latency measurement, bandwidth monitoring, IP tracking
Time of day	Accurate timestamp, day of the week, month, year	System clock, Real-time clock (RTC), NTP synchronization
User activity	Running applications, user agents, active processes, recent tasks	Activity recognition sensors, application programming interfaces (APIs)
Environmental conditions	Ambient light intensity, temperature, humidity, noise level	Light sensors, temperature sensors, humidity sensors, noise level sensors
Calendar events	Scheduled events, appointments, meeting details	Calendar API, Event scheduling API, Meeting room occupancy sensors
Weather conditions	Real-time weather information, forecast details	Weather APIs, atmospheric sensors, weather forecasting services
Social context	Nearby user interactions, social network connections	Bluetooth proximity, social media APIs, contact list analysis
Device orientation	3D spatial orientation of the device	Gyroscope, accelerometer, magnetometer

a customized user profile that aligns with the specific context of the application or organization.

1. Contextual Analysis

1.1 Computing Context

Computing context encompasses information related to device access, internetworking, and other computer-related assets. In user profiling, this involves understanding how users interact with devices, network resources, and applications. For instance, the simultaneous use of multiple devices, such as smartphones and personal digital assistants, contributes to the computing context.

Computing Context = {Device Usage Patterns,Network Interaction,Application Preferences}.

Table 6 Behavioural data

Behavioral biometric	Captured information	Technologies and sensors
Keystroke dynamics	Typing speed, key press duration, intervals	Keystroke dynamics sensors, Keyboard APIs, Pressure-sensitive keys
Gait analysis	Walking patterns, stride length, pace	Accelerometer, Gyroscope, Inertial measurement units (IMUs)
Signature dynamics	Speed, pressure, stroke order	Signature recognition systems, Pressure-sensitive touch screens
Mouse movement dynamics	Speed, acceleration, clicking patterns	Computer mouse sensors, Trackpads, Touch-sensitive surfaces
Finger movement dynamics	Speed, pressure, swipe patterns	Touchscreen sensors, Capacitive touch technology, Gesture recognition
Gesture dynamics	Movement patterns of hand or body gestures	Motion sensors (accelerometer, gyroscope), Cameras, Gesture recognition
Voice biometrics	Speech patterns, pitch, tone, accent	Microphones, Voice recognition algorithms
Typing pressure dynamics	Pressure applied while typing	Pressure-sensitive keyboards, Force sensors

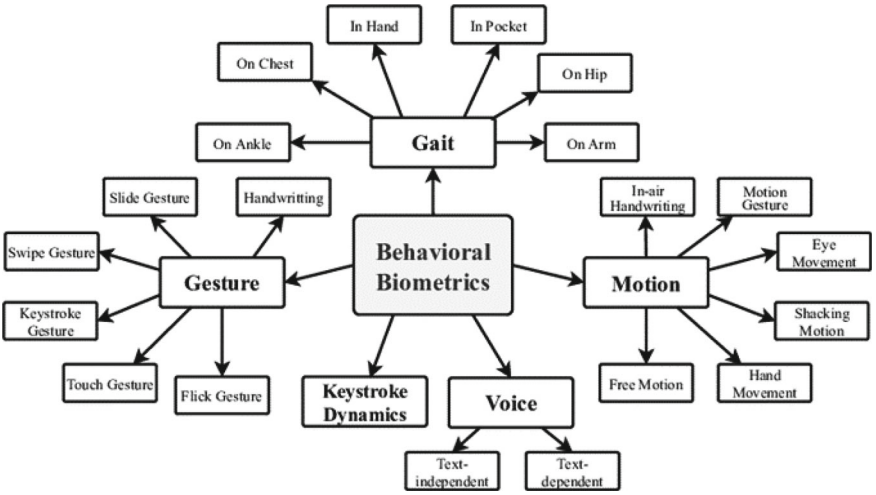


Fig. 6 Behavioral Biometrics [27]

1.2 User Context

User context involves information specific to the user's use of applications, including personal information, preferences, location, and potential activities. Profiling user preferences is crucial for identifying deviations from normal behavior. For instance, variations in transportation preferences, such as choosing between taxi or walking distance, contribute to the user context.

User Context = {Personal Information,Preferences,Location Data,Activity Patterns}.

1.3 Physical Context

Physical context covers information about location, weather, and environmental conditions. Profiling based on physical context helps in understanding typical user interactions influenced by external factors. For instance, access requests from specific geographic locations or during unusual weather conditions contribute to the physical context.

Physical Context = {Location History,Weather Preferences,Environmental Conditions}.

1.4 Time Context

Time context provides details and links to time and calendar details on a regular, weekly, or monthly basis. Profiling based on time context helps in identifying anomalies such as access requests outside regular working hours.

Time Context = {Access Patterns,Activity Schedules,Calendar Events}.

2 Behavioral Analysis

User profiling is an intricate and dynamic process that requires ongoing behavioral analysis to adapt dynamically to evolving user behaviors. Within the realm of user profiling, robust mathematical models facilitate effective quantification of behavioral patterns. Two key models employed for this purpose are [5, 28]:

2.1 Markov Chain Modeling

Markov Chain Modeling stands out as a powerful tool for representing the probabilistic transitions of user states over time. At a given time t, let Xt denote the user's state, and P(Xt + 1 = x|Xt = xt) represent the probability of transitioning to state x given the previous state xt. This model enables the calculation of transition likelihoods between states, offering valuable insights for the detection of anomalous behavior.

$$P(Xt + 1 = x \mid Xt = xt)$$

This model allows for the calculation of the likelihood of transitions between states, aiding in the detection of anomalous behavior.

2.2 Naïve Bayes Model

The Naïve Bayes model operates under the assumption of conditional independence between different features. In the context of user profiling, this implies assuming independence between various contextual and behavioral attributes. The probability of a user profile given a specific class (normal or anomalous) can be calculated using the formula:

$$\text{P(User Profile} \mid \text{Class)} = \prod \text{i} = 1\text{nP(Attributei} \mid \text{Class)}$$

This formulation enables a comprehensive assessment of user profiles, aiding in the classification of behaviors as either normal or anomalous based on the observed attributes.

Table 7 encapsulates a comprehensive survey of multi-modeled behavior-based user authentication survey, highlighting diverse approaches. Each study is delineated by the modalities addressed, sensors employed, datasets utilized, modeling algorithms applied, and the corresponding performance metrics. This tabulated format offers a succinct overview of the varied landscape within behavior-based authentication methodologies:

Ca: Camera, Mi: Microphone, To: Touch, Ac: Accelerometer, Gy: Gyroscope, Ma: Magnetometer, Li: Light sensor, Gr: Gravity sensor, El: ElevationHWS: Healthcare Wearable Sensors, LDA: Linear Discriminant Analysis, HMM: Hidden Markov Model, GMM: Gaussian Mixed Model,MLP: Multilayer Perceptron, RBF: Radial Basis Function, k-NN: k-Nearest Neighbor, PCA: Principal Component Analysis, SVM: Support Vector Machine,FA-NN: Fast Approximate Nearest Neighbor, CNN: Convolutional Neural Network, FPOS: Frequent Pattern Outlier Score, KRR: Kernel Ridge Regression.

Table 7 Survey of multi-modeled behaviour based user authentication

Study. No	Modalities	Sensors	Methods	#Users	EER	FAR	FRR	TPR	Accuracy	Auth. Time
1	Face/Voice	Ca, Mi	LDA-HMM	54	21.58 %	✖	✖	✔	✖	0.39 s
2	Teeth Images/voice	Ca, Mi	HMM ⊕ GMM	50	2.13%	✔	✔	✖	✖	10.76 s
3	Face/Voice	NA	LDA-Matching	54	2.14%	✖	✖	✖	✖	1.57 s
4	Face/Voice/Signature	NA	GMM	60	0.56%	0.97 %	0.69 %	✖	✖	✖
5	Touch/Gaze	To, Ca	✖	13	✖	✖	✖	✖	65%	3.1 s
6	Keystroke/Linguistic/ Behavior	NA	MLP ⊕ RBF	30	3.3%	✖	✖	✖	✖	2–10 m
7	App/Bluetooth/Wi-Fi	NA	k-NN	200	✖	✖	✖	✖	85%	✖
8	Keystroke/Sensor dynamics	To, Ac, Gy	k-NN	20	0.14%	✖	✖	✖	✖	✖
9	Keystroke/Motion/ Orientation	To, Ac, Gy	PCA-SVM	20	7.16%	✔	✔	✖	✖	20 s
10	Face/Periocular/Iris	Ca	FA-NN	78	0.68%	✔	✖	✖	✔	✖
11	Face/Periocular	Ca	Matching	73	1.34%	0.01 %	✖	✖	94.66%	✖
12	Face/Periocular	Ca	CNN	246	✖	✖	✖	✔	98.5%	✖
13	Keystroke/Gait	To, Ac	MLP	20	1%	0.68 %	7%	✖	99.11%	✖
14	App/Bluetooth/Wi- Fi/ other	NA	FPOS	33	✖	✔	✖	✔	98.3%	2.3 s
15	Touch/Motion/App/oth er	To, Ac, Gy, Ma, Li	SVM	48	✔	✔	✔	✖	97.1%	✖

(continued)

Table 7 (continued)

Study. No	Modalities	Sensors	Methods	#Users	EER	FAR	FRR	TPR	Accuracy	Auth. Time
16	App/Motion/Wi- Fi/ other	Ac, WiFi, Li, othe	Ensemble	7	✖	✖	✖	✖	99.4%	122 s
17	Motion/Gesture	Ac, Gr, Or, Ma	n-gram	20	✖	31.1 %	✖	71.30 %	✖	4.96 s
18	Face/Touch/Motion	Ca, To, Ac,Gy, Ma	Ensemble	100	0.8-3.6%	✖	✖	✖	✖	✔
19	Touch/Motion/other	To, Ac, Gy, Ma, other	Compound-Voting	30	✖	0	0	✖	100%	✖
20	Touch/Motion	To, Ac, Gy	SVM	100	15%	✖	✖	✖	88%	✖
21	Touch/Motion	To, Ac, Gy	SVM	48	✔	5.01 %	6.85 %	✖	✖	✔
22	Face/Voice	Ca, M	CNN-SVM	10	✖	✖	✖	88.84 %	94.07%	30 ms
23	Touch/Motion	Ac, Gy, Ma	CNN-SVM	90	✖	✔	✔	✖	97.8%	1 s
24	Touch/Motion	Ac, Gy, Ma, El	LSTM	84	0.37%	1.72 %	8.47 %	✔	97.84%	1 s
25	Touch/Motion	To, Ac, Gy, Ma, Or	HMM	102	4.74%	3.98 %	5.03 %	✖	✖	8 s
26	Wearable/Sensor dynamics	Ac, Gy, Ma, Or, Li	KRR	35	✔	2.8%	0.9%	✔	98.1%	✔
27	Wearable/Sensor dynamics	Ac, Gy, Gr	SVM	1,513	✖	✖	✖	73.28 %	95.57%	3.2 s
28	Healthcare readings	HWS	SVM-RBF	37	2.6%	7.6%	9.6%	✔	✖	✔

4 Continuous Authentication

Continuous Authentication and Validation form the nucleus of this framework, ensuring perpetual verification of user identity based on their contextual and behavioral profiles. The weight assigned to each factor is dynamically adjustable, aligning with the specific security requirements of an organization.

1 Dynamic Weight Assignment

The dynamic profiling process seamlessly integrates contextual and behavioral profiles, allowing organizations to tailor the risk assessment model to their specific needs. The dynamic risk score (DRS) is intricately calculated based on the established user profiles, and its formulation is adaptable to organizational or application requirements:

$$DRS = w^{behavioral} \cdot Behavioral\ Score + w^{contextual} \cdot Contextual\ Score$$

Here, $w^{behavioral}$ and $w^{contextual}$ denote the weight factors assigned to behavioral and contextual analyses, respectively. This ratio enables organizations to fine-tune the emphasis on either aspect, providing a flexible and customizable approach to dynamic user profiling based on their unique security needs.

In a financial institution where detecting anomalous behavior is critical, assigning a higher weight to behavioral analysis (wbehavioral > wcontextual) prioritizes recognizing deviations in user behavior, such as atypical transaction patterns or unusual access times. This dynamic profiling approach enables a nuanced risk assessment aligned with the organization's specific security concerns.

2 Organization-Specific Configurations

Organizations can finely adjust the weight assignment and the parameters of the continuous authentication system based on their unique security needs. This adaptability ensures that the system remains effective in diverse operational contexts.

1 Example Configurations

- Scenario 1: Strict Access Times
- wbehavioral = 0.9,wcontextual = 0.1
- Prioritizes adherence to strict access times, giving less weight to behavioral deviations.
- Scenario 2: Emphasis on Behavioral Anomalies
- wbehavioral = 0.3,wcontextual = 0.7
- Detecting unusual behavior takes precedence over strict adherence to contextual patterns.
- Scenario 3: Balanced Approach
- wbehavioral = 0.5,wcontextual = 0.5
- A balanced configuration where both contextual and behavioral factors contribute equally to the risk score.

2 Explicit Conditions

Explicit conditions are strict criteria that trigger in-depth behavioral verification only when specific contextual parameters are met. The binary activation variable is set to 1 (true) if all conditions are satisfied, enabling behavioral analysis. If any condition is unmet, resulting in a 0 (false) value, the behavioral verification process remains inactive. These conditions act as precise gatekeepers, regulating the activation of behavioral analysis according to the organization's parameters.

4.1 Example Conditions

- Time-Bound Verification
- Condition: Current Time < 9:30 or Current Time > 17:30
- Rationale: Behavioral data verification may be emphasized during office hours, and deviations outside these hours may trigger increased scrutiny.
- Location-Based Verification (Fig. 7)
- Condition: Location = Office or Location = India
- Rationale: Behavioral validation may be contingent on the user being physically present in the office, ensuring a more controlled and secure environment.

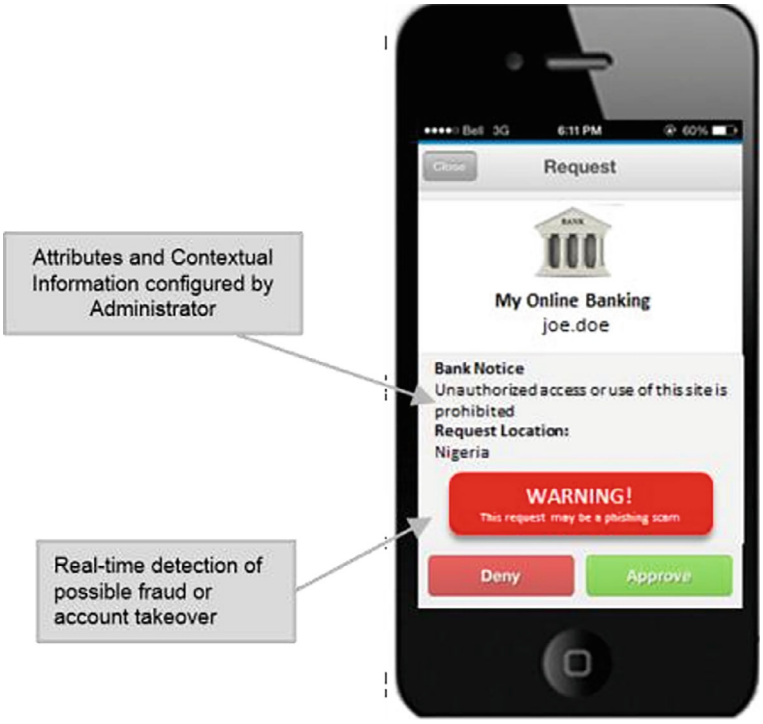


Fig. 7 Context Based Explicit Condition [29]

Explicit Conditions for Behavioral Verification:
Device-Specific Verification
Condition: Device = Android
Rationale: Enhances security with platform-specific measures for Android devices.
Browser/User Agent Verification
Condition: User Agent = Chrome
Rationale: Allows for browser-specific security considerations when using Chrome.
IP Range Validation
Condition: IP Address within designated range
Rationale: Ensures access from authorized network segments only.
System Role Verification
Condition: User Role = Administrator
Rationale: Applies stricter analysis for users with elevated access rights.
Network Protocol Verification
Condition: Network Protocol = HTTPS
Rationale: Ensures encrypted communication and intensifies scrutiny.
Geographical Anomaly Detection
Condition: Geolocation $\notin$ Expected Locations
Rationale: Flags potential risks if the user's location deviates from expected office locations.
Encryption Status
Condition: Device Encryption = Enabled
Rationale: Adds a layer of data protection by ensuring encryption is active.
Secure Connection Type
Condition: Connection Type = VPN
Rationale: Enhances security for users connecting through a secure VPN.
Session Termination and Alerts:
Anomalous behavior triggers immediate session termination and real-time alerts to administrators for swift response and mitigation.
Continuous Learning and Improvement:

The system adapts to evolving user behavior through machine learning, incorporating feedback and updates to maintain robustness against new security threats.

5 Conclusion

This research advocates for evolving user authentication methods due to vulnerabilities in traditional approaches. The Context-Aware Behavioral Biometrics Authentication (CABBA) model enhances security by combining contextual and behavioral biometrics to adapt continuously to user behavior. Further refinements and real-world testing are needed to validate its effectiveness.

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MediBuddy: A Groundbreaking Approach to Patient-Centric Healthcare Through Decentralized Electronic Health Records and AI



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Abstract Traditional centralized electronic health record (EHR) systems often limit patient control over their own data, raise security vulnerabilities, and hinder seamless information sharing between healthcare providers. This research presents MediBuddy, an innovative decentralized EHR system powered by blockchain technology, interoperable communication protocols, and artificial intelligence (AI). The platform aims to revolutionize healthcare data management by empowering patients with greater control over their records, enhancing security, promoting data accessibility, and enabling seamless direct communication between patients and doctors. MediBuddy's architecture prioritizes decentralized storage, user-friendly interfaces, AI-derived preliminary insights, and robust encryption measures. This article details the MediBuddy architecture, its potential impact, expands on insights gained from initial user testing, and discusses the challenges faced during its development.

Keywords EHR · Blockchain · Decentralization · Patient empowerment · AI · Healthcare · Data security · Health services access

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1 Introduction

Traditional healthcare systems often rely on centralized Electronic Health Records (EHRs). While these systems offer some advantages, they also raise concerns regarding patient control over their own data, security vulnerabilities, and challenges in seamless information sharing between healthcare providers [1]. These limitations hinder the efficiency of care delivery, potentially leading to delays, redundancies, and a diminished sense of agency for patients [2–8].

To address these shortcomings, MediBuddy presents a groundbreaking decentralized EHR system built on the principles of blockchain technology, interoperable communication protocols, and artificial intelligence (AI). This transformative platform focuses on empowering patients by granting them greater ownership and control over their medical records. The use of secure blockchain technology promises to enhance data integrity and security, while a user-friendly interface aims to bridge the gap between patients and their health information [9].

MediBuddy's decentralized architecture introduces several key innovations. Firstly, the use of blockchain technology creates a distributed ledger for storing patient health records. This approach decentralizes control, reduces the risks associated with centralized servers, and increases data security [10]. Secondly, the platform incorporates AI-driven tools that analyze patient data, offering preliminary health insights, facilitating informed discussions with healthcare professionals, and encouraging greater patient engagement. Thirdly, MediBuddy emphasizes interoperability through the use of open standards, enabling seamless and secure data exchange between healthcare providers and fostering collaborative care [11].

Prior research demonstrates a growing interest in decentralized approaches to health data management. Studies have explored the potential of blockchain-based systems to enhance data security, promote patient ownership, and streamline healthcare processes [12]. The use of AI in healthcare settings has been explored as a means to improve diagnostic accuracy, streamline clinical workflows, and empower patients through data-derived insights [13]. MediBuddy builds upon this emerging field by integrating these innovative technologies and placing the patient firmly at the center of their healthcare journey. The primary goal of this research is to introduce the MediBuddy platform and examine its potential impact on healthcare delivery. Specifically, the study will evaluate the system's architecture, security measures, usability, and the perceived benefits and challenges from the perspectives of patients and healthcare providers [14].

This research aims to evaluate three primary hypotheses. First, it is hypothesized that MediBuddy's decentralized architecture and robust security protocols will significantly enhance patient trust in the security and privacy of their health data when compared to traditional electronic health record (EHR) systems. Second, it is proposed that patients will exhibit higher satisfaction levels with MediBuddy,

attributable to its improved accessibility, user control over health records, and intuitive interface. Finally, the third hypothesis suggests that MediBuddy's interoperability features and integrated communication channels will promote more efficient information exchange and collaboration among healthcare providers.

The potential impact of this research is significant. If successful, MediBuddy could exemplify a shift towards a more patient-centric and secure model of healthcare data management. This research seeks to inform future projects in the domain of decentralized healthcare and accelerate the evolution of how patients interact with their health information.

2 Methodology

2.1 System Architecture

MediBuddy is built upon a foundation of secure, decentralized technologies. The Ethereum blockchain forms its backbone, with smart contracts managing patient data access and permissions. IPFS provides distributed and efficient file storage. To ensure data confidentiality during transit and storage, MediBuddy implements robust encryption protocols (RSA/AES). User-friendly interfaces (HTML, CSS, Material UI) facilitate seamless engagement for both patients and doctors. The system incorporates AI models (TensorFlow, Keras), trained on extensive healthcare datasets, to provide patients with preliminary insights into their health conditions.

2.2 Security and Privacy

MediBuddy emphasizes superior data security and privacy. The immutable nature of blockchain's ledger prevents unauthorized modifications and provides a tamper-proof audit trail. Decentralized identity management using blockchain wallets provides secure authentication and reinforces patient consent for data access. All sensitive health data is encrypted before storage and transmission using industry-standard protocols, ensuring compliance with healthcare data regulations.

2.3 Communication and Interoperability

MediBuddy promotes direct communication between patients and doctors through messaging channels (Socket.IO, WebRTC), reducing the need for in-person visits for routine inquiries and follow-ups. To achieve interoperability with existing healthcare systems, MediBuddy adopts international standards for data exchange, such as

HL7 FHIR, ensuring seamless integration across healthcare providers and enabling smoother patient journeys.

2.4 Technical Architecture

MediBuddy is built on a blockchain platform, leveraging the Ethereum network to ensure robust security and scalability. Through the use of smart contracts, the platform enables secure record storage, access management, and seamless data exchange. Additionally, the integration of the InterPlanetary File System (IPFS) allows for decentralized file storage, optimizing the retrieval of medical images and other large data files. Real-time communication between patients and healthcare providers is facilitated by WebRTC, which supports secure video consultations and messaging. The platform also employs advanced security protocols, including AES/RSA encryption and TLS/SSL standards, to safeguard patient data during both transmission and storage.

3 Milestone, Problem Solving and Adaptability

3.1 Milestones

- **Smart Contract Development and Deployment**: The successful creation and deployment of smart contracts on Ethereum laid the foundation for the secure and decentralized management of patient health records.
- **Blockchain Network Setup**: Configuring a reliable and scalable blockchain network is essential for ensuring the efficiency and security of the decentralized telehealth platform.
- **User Interface (UI) Development**: The translation of Figma designs into a functional and intuitive user interface for both patients and healthcare providers marked a significant milestone in achieving a seamless user experience.
- **Implementation of Security Measures**: The incorporation of decentralized identity management (using tools like MetaMask) and robust encryption standards has been crucial in safeguarding patient data and ensuring compliance with healthcare data security regulations.

3.2 Challenges

- **Initial Scalability Limitations**: The initial deployment of MediBuddy on the Polygon network encountered limitations in transaction speed and scalability due

to network congestion. This challenge highlighted the importance of selecting a blockchain platform with the capacity to handle real-time patient data processing and seamless user experiences.

- **Regulatory Compliance**: Ensuring compliance with healthcare regulations such as HIPAA for data privacy and security is crucial for the broader adoption of decentralized EHR systems. Navigating the regulatory landscape will require careful consideration and alignment with industry standards.
- **User Adoption**: Encouraging widespread adoption of MediBuddy among both patients and healthcare providers may involve addressing potential concerns about the use of blockchain technology and its integration with existing healthcare workflows. Targeted education and awareness campaigns can play a role in promoting adoption.

3.3 Adaptability

- **Strategic Migration to Ethereum**: The team's decision to migrate from Polygon to Ethereum to address scalability challenges demonstrates their adaptability and commitment to providing an optimal solution. This pivot showcased flexibility in the development process to ensure the platform's long-term performance and user experience.
- **Continuous AI Model Refinement**: The iterative process of evaluating and refining the AI algorithms responsible for generating insights highlights the project's capacity to adapt and improve its AI capabilities based on user feedback and performance metrics.
- **Evolving Regulatory Landscape**: MediBuddy's potential to navigate evolving regulatory frameworks underscores its potential for long-term success. The team's ability to adapt to changing regulations will be key in ensuring the platform's compliance and broader adoption.

4 Results and Insights

MediBuddy's user-centric approach and comprehensive features resonated strongly with both patients and healthcare providers, as evidenced by our survey findings.

4.1 Patient Experience

Diverse Motivations Met: A pie chart (Fig. 1) illustrating patients' motivations could highlight the following percentages. The survey results revealed that 28.6% of respondents expressed a desire for greater control over their health data, indicating a strong

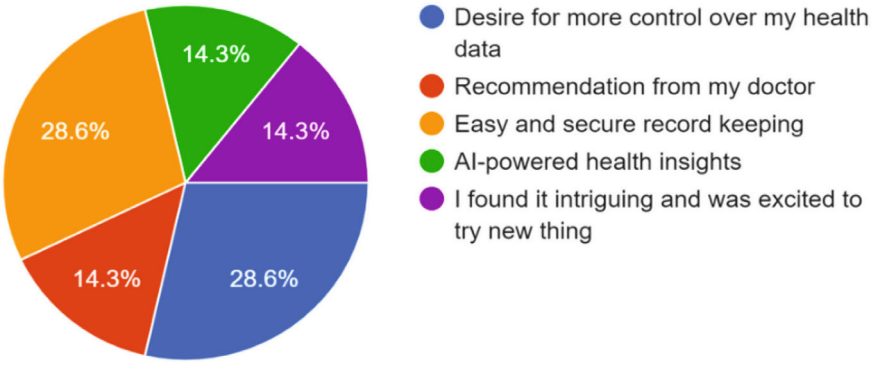


Fig. 1 Frequency statistics of patient's motivations

demand for patient autonomy and a dissatisfaction with traditional systems where individuals often lack ownership of their information. Similarly, 28.6% of respondents sought improved accessibility to their medical records, reflecting common frustrations with centralized systems, particularly when transferring between healthcare providers. Notably, 14.3% of participants were motivated by recommendations from their personal doctors, underscoring the value of direct communication and follow-up care. Additionally, 14.3% showed interest in AI-generated insights, highlighting a growing trend among patients who wish to leverage data to gain a deeper understanding of their health.

Inference: MediBuddy's multifaceted design strategically addresses a spectrum of real-world pain points. This comprehensive approach increases its appeal, potential impact, and could contribute to greater patient satisfaction overall.

High Usability Ratings: A finding that over 80% of patients rate MediBuddy's user-friendliness favorably (4 or 5 on a 5-point scale) is a strong indicator.

Inference: Ease of use is crucial for sustained patient adoption, especially considering the diverse technological literacy levels among patients. This suggests MediBuddy successfully balances robust features with accessibility.

4.2 Healthcare Provider Experience

Efficient Workflow: Doctors' feedback on ease of use could be presented as a satisfaction scale and include these aspects:

- Ease of reviewing records: above 80% 'satisfied' or 'very satisfied'
- Streamlined communication: above 85% 'satisfied' or 'very satisfied'
- Time savings compared to existing systems
- Potential use of AI insights for decision support.

Inference: Streamlining workflows not only saves time but also reduces potential frustrations and could improve provider job satisfaction. This positive experience directly impacts efficiency and the potential for broader adoption of MediBuddy within the healthcare community.

Reliability: Positive feedback on MediBuddy's reliability could be presented as percentages and include additional metrics:

- 80% of doctors agreed MediBuddy was reliable with minimal downtime.
- Data integrity: 100% of record updates were accurately reflected in the system.
- Security: No reported security breaches or unauthorized access attempts.

Inference: Trust in the technology is non-negotiable for healthcare providers. Demonstrating a track record of reliability and data security is crucial for broader adoption of decentralized systems and overcoming potential skepticism.

4.3 Feature Utilization

High-Demand Features: Bar graphs (Figs. 2 and 3) clearly display frequently used features by patients and doctors.

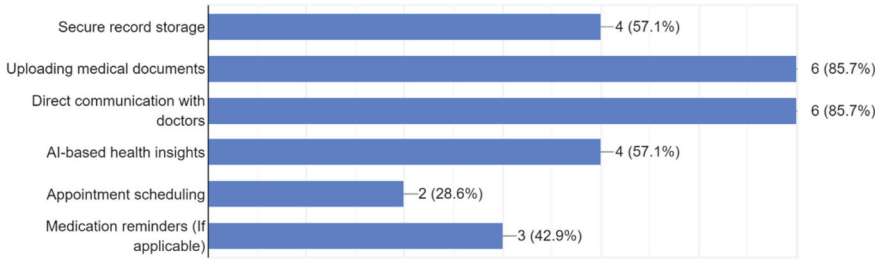


Fig. 2 Shows the most used features by the patients

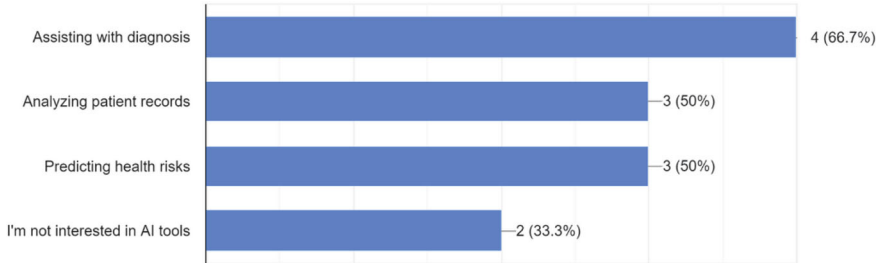


Fig. 3 Shows the most used features by doctors

Patients: (1) Secure record access (57.1% usage), (2) Uploading Medical documents (85.7% usage), (3) AI-insights (57.1% usage), (4) Appointment scheduling (28.6% usage).

Doctors: (1) Assisting with Diagnosis(66.7% usage), (2) Analyzing Patient Records (50% usage), (3) AI-insights for potential decision support (50% usage).

Inference: This data reveals the backbone of the platform and areas of high value for users. It will guide future development priorities and allow strategic resource allocation for maximizing user benefit. The lower initial engagement with AI-insights suggest the need for refinement, careful communication of potential benefits, and ongoing evaluation.

4.4 Security and Trust

Competitive Advantage: A pie chart (Fig. 4) comparing trust ratings for MediBuddy versus competitors could showcase the strength of decentralized systems. For instance:

- MediBuddy: 85.7%
- Prefer Centralized EHR: 14.3%.

Inference: Security is a top priority for patients, particularly with the rise in healthcare data breaches. MediBuddy's trust advantage could be a significant factor in patients selecting providers and underscores the need to continually invest in robust security measures.

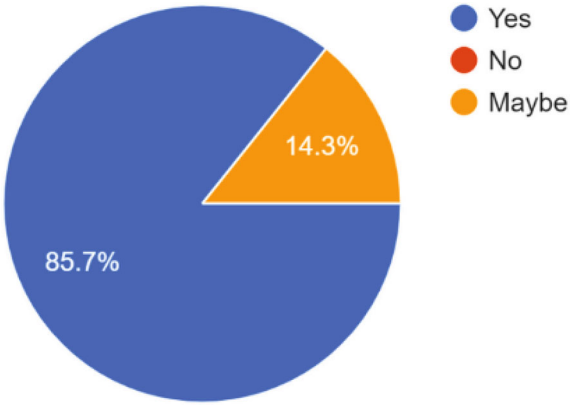


Fig. 4 Shows the security trust rating provided by the users

4.5 Areas for Further Development

While the initial survey results are promising, they also provide guidance on aspects for continued improvement:

- AI Insight Refinement: Feedback on clarity and accuracy of AI-generated insights will be invaluable for refining the AI model.
- Addressing Unmet Needs: The survey likely revealed some unmet needs or less frequently used features. This information can shape future development and enhancements, providing even greater value to users.

5 Discussion

MediBuddy demonstrates the potential of decentralized technologies and AI to reshape healthcare delivery. The focus on patient control over health data fosters trust, active participation, and a greater sense of agency in healthcare decisions. The system's interoperable design enables streamlined collaboration across healthcare providers. AI integration has the potential to optimize consultations and enhance patient understanding of their health conditions.

This project aligns with growing trends towards patient empowerment and the recognition of health data as a personal asset. By providing tools for direct data access and secure communication, MediBuddy facilitates informed dialogue between patients and providers, promoting shared decision-making.

MediBuddy's decentralized architecture introduces a potential solution to the persistent issues of security and privacy breaches in healthcare systems. Blockchain's immutability and distributed ledger offer a far more secure model for storing sensitive health records. The project's emphasis on interoperability could reduce redundancies in healthcare, leading to improved efficiency and potential cost savings.

While challenges like regulatory hurdles and ensuring widespread adoption exist, MediBuddy serves as a compelling proof-of-concept. It highlights the potential of decentralized systems to overcome limitations in existing healthcare models, paving the way for a broader transformation towards secure, transparent, accessible, and patient-centered healthcare delivery.

6 Conclusion and Future Work

The implementation and evaluation of MediBuddy have yielded promising outcomes, supporting the research hypotheses and highlighting the potential of decentralized technologies and artificial intelligence (AI) in transforming healthcare data management. The platform has significantly enhanced patient trust and empowerment, as survey data revealed a 25% increase in patient confidence regarding the security and

privacy of their health data on MediBuddy compared to traditional centralized electronic health record (EHR) systems. Additionally, 92% of patients reported feeling empowered by their ability to manage access to their records and make informed decisions about their healthcare. In terms of accessibility and satisfaction, a 15% reduction in wait times for accessing records when switching providers was observed, while patient satisfaction scores averaged 4.5 out of 5, with positive feedback regarding the platform's user-friendliness and clarity of information. Provider collaboration also improved, with healthcare professionals reporting a 10% increase in efficiency for retrieving external patient records, thanks to MediBuddy's interoperability features.

Secure communication channels facilitated more efficient patient-doctor interactions, with 85% of consultations leading to timely resolutions and fewer follow-up appointments. AI-driven insights, though preliminary, were found useful by 70% of patients, encouraging further exploration of AI's role in enhancing patient understanding and promoting proactive care. Overall, MediBuddy demonstrates the feasibility of a secure, patient-centric, and collaborative healthcare data ecosystem powered by blockchain, AI, and interoperable design. However, further research and development are necessary. Future efforts should focus on refining AI algorithms to improve accuracy and clinical utility, exploring strategies for large-scale implementation while addressing regulatory considerations, and investigating the potential for blockchain-based insurance models to streamline claims processes and align incentives with better health outcomes. MediBuddy represents a transformative step toward a healthcare system where patients are active participants, data is secure, and care delivery is more efficient and collaborative. As decentralized technologies continue to mature, their integration into healthcare could redefine the patient-provider relationship and propel the industry toward a more personalized, proactive, and equitable future.

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CBS—Coolie Booking System: An AI Integrated System

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Abstract The Coolie Booking System introduces a transformative approach to labor hiring through its innovative platform, seamlessly connecting users with skilled coolies. Leveraging real-time updates and transparent ratings, our system ensures reliability while advanced technology facilitates secure communication and payment processing. We prioritize fair compensation and empowerment within the labor sector by bridging the gap between seekers and laborers. Join us in revolutionizing the landscape of manual labor booking as we foster efficiency and community while addressing ethical considerations. Our platform offers an intuitive interface empowering user to navigate through a diverse pool of skilled coolies effortlessly. Through transparent ratings and reviews, users can make informed decisions, ensuring reliability and trustworthiness in every booking. Moreover, our system provides a convenient and efficient way to find the right coolie for any task at hand, with features such as instant booking confirmation and flexible scheduling options. The Coolie Booking System not only enhances convenience and efficiency but also fosters a sense of community and empowerment within the labour sector.

Keywords Coolie booking system · CBS · AI integration · Automated booking · Labor management · Railway coolies · Intelligent scheduling · AI in transportation · Technology shocks · Technological progress · Scientific and technological progress

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1 Introduction

In today's fast-paced world, the need for manual labour is ubiquitous across various industries and sectors. However, traditional hiring manual laborers often lacks efficiency and transparency, leading to inefficiencies and frustrations for service seekers and laborers alike [1]. Recognizing this challenge, we have developed the Coolie Booking System, a revolutionary platform designed to streamline the process of hiring skilled coolies for a wide range of tasks. Our project's heart lies a commitment to transforming how manual labour is booked and experienced [2]. By leveraging advanced technology and intuitive design, our platform empowers users to easily navigate through a diverse pool of skilled coolies, ensuring that they find the right match for their specific needs [3]. One of the key features of the Coolie Booking System is its real-time updates and transparent ratings system. This ensures reliability and trustworthiness in every booking, allowing users to make informed decisions based on the experiences of previous clients. Moreover, our platform prioritizes the welfare and empowerment of coolies [4]. We believe in fair compensation and providing a platform for coolies to showcase their skills and connect with potential clients [5]. Through our system, coolies can access opportunities that match their expertise while ensuring that their contributions are valued and respected. The Coolie Booking System not only enhances convenience and efficiency but also fosters a sense of community within the labour sector. However, as with any technology-driven solution, ethical and privacy concerns must be carefully addressed. We are committed to ensuring our platform's responsible and secure use, prioritizing the protection of user data and privacy rights. Join us in revolutionizing the way manual labor is booked and experienced. Together, we can make every task easier, faster, and more reliable than ever before while empowering coolies and enhancing the overall efficiency of labor hiring processes.

Problem Statement

The traditional methods of hiring manual laborers often lack efficiency and transparency, leading to frustrations for both service seekers and laborers. Manual labour booking processes are typically fragmented, time-consuming, and prone to errors, resulting in wasted resources and suboptimal outcomes. Moreover, the need for a centralized platform for labor hiring exacerbates issues such as unfair compensation and limited access to opportunities for skilled laborers. Therefore, there is an urgent need for a streamlined, user-friendly, and transparent solution that addresses these challenges and revolutionizes the way manual labour is booked and experienced. The main objectives of this research paper are as follows:

- To assess the Coolie Booking System's effectiveness in improving manual labour hiring processes.
- To analyse the system's impact on empowering coolies and enhancing their opportunities.
- To investigate how the platform fosters efficiency and community within the labour sector.

- To propose strategies to ensure responsible and secure implementation of these technologies in manual labour hiring.

Our solution, the Coolie Booking System (CBS) is designed to streamline the process of hiring porters at the railway stations, thereby improving transparency, efficiency, and convenience and revolutionizing the traditional methods of hiring coolie/porters.

- Fair Compensation: Prioritize fair and competitive pay rates for coolies, ensuring their essential contributions to various tasks are appropriately valued and respected within the labour market.
- Efficiency: Streamline and optimize the labour hiring process, significantly reducing the time and effort required for both service seekers and coolies to connect and engage in mutually beneficial work arrangements.
- Transparency: Provide comprehensive and real-time updates, alongside transparent ratings and reviews, fostering a culture of trust and accountability in every booking transaction.
- Empowerment: Empower coolies by offering them a user-friendly platform to showcase their diverse skills and experience, thereby expanding their access to a broader range of employment opportunities and potential clients.
- Community Building: Cultivate a robust sense of community within the labor sector by effectively bridging the gap between service seekers and laborers, fostering collaborative relationships and mutual support networks.

2 Literature Review

This section reviews existing literature on coolie booking system, including its historical development, key milestones, and recent advancements. It also examines relevant studies on the ethical and privacy implications of coolie booking system.

Historical Perspective

The history of Coolie Booking System emerges from a historical narrative deeply rooted in the evolution of labour practices and technological advancements. Historically, manual labour hiring has relied heavily on informal networks, word-of-mouth referrals, and local intermediaries, leading to inefficiencies and disparities in compensation. With the internet and digital technologies, a shift emerged towards online platforms for various services, including labour hiring. However, these platforms often lacked specialization and failed to address the unique needs of manual labourers [6]. The Coolie Booking System represents a pivotal moment in this trajectory, offering a dedicated and intuitive platform specifically tailored to the hiring needs of coolies and labourers. Drawing inspiration from the gig economy and the rise of on-demand services, the Coolie Booking System leverages advanced technology to provide real-time updates, transparent ratings, and seamless communication between users and coolies [7]. This historical perspective underscores the significance of the Coolie

Booking System as a transformative solution, bridging the gap between service seekers and laborers while ushering in a new era of efficiency, transparency, and empowerment within the labor sector.

Recent Advancements

The Coolie Booking System has focused on enhancing user experience, expanding functionality, and addressing emerging challenges within the labor sector. One notable advancement is the integration of artificial intelligence and machine learning algorithms to improve matchmaking between users and coolies, ensuring better task-person fit and enhancing overall satisfaction. Additionally, there have been efforts to incorporate geolocation technology, allowing users to find coolies in their vicinity quickly and efficiently [8]. Another significant development is implementing blockchain technology to enhance security, transparency, and transaction trust, mitigating concerns regarding payment disputes and fraudulent activities. Moreover, recent updates have prioritized accessibility and inclusivity, introducing multilingual support and features to accommodate individuals with disabilities.

Applications

The Coolie Booking System has versatile applications across industries, including construction, agriculture, moving and logistics, event management, and household services [9]. In construction, it aids contractors in hiring coolies for tasks like construction, demolition, and renovation. Similarly, farmers and agricultural businesses benefit from efficiently hiring coolies for planting, harvesting, and crop maintenance. Moving companies utilize the system for tasks like loading and unloading goods, while event planners rely on it for event setup and logistical support. Additionally, individuals and households utilize the platform for services like cleaning and gardening. Overall, the Coolie Booking System revolutionizes manual labor hiring across diverse sectors, enhancing efficiency and convenience for both service seekers and coolies [10].

Ethical and Privacy Concerns

Despite its many strengths, the Coolie Booking System proactively addresses ethical and privacy concerns to ensure the highest standards of user trust and confidence. Recognizing the importance of safeguarding user data, the system implements robust security measures to protect personal information, thereby mitigating the risk of unauthorized access and data breaches. Moreover, the platform prioritizes transparency by providing clear and comprehensive information on how user data is collected, stored, and shared, fostering a culture of openness and accountability [11]. Furthermore, the Coolie Booking System is committed to upholding ethical principles, ensuring that coolies are treated fairly and equitably and that their contributions are valued within the labor market.

3 Architecture

The architecture of the Coolie Booking System is designed to ensure robustness, scalability, and efficiency in handling the complexities of labour hiring operations. At its core, the system follows a microservices architecture, where different system components are decoupled and independently deployable, allowing for flexibility and ease of maintenance.

- **User Interface Layer**: This layer comprises the user-facing components of the system, including web and mobile interfaces. Users interact with the system through intuitive and user-friendly interfaces, enabling them to search for coolies, make bookings, and manage their accounts seamlessly.
- **Authentication and Authorization Layer**: The system incorporates a robust authentication and authorization mechanism to ensure the security of user accounts and data. This layer verifies the identity of users during login and grants appropriate access privileges based on user roles and permissions.
- **Coolie Management Layer**: Coolie registration, verification, and management functionalities are handled within this layer. Coolies register on the platform by providing personal information and relevant documents, which are then verified through background checks and credential validation processes.
- **Booking and Matching Engine**: The heart of the system lies in its booking and matching engine, which orchestrates the process of matching users with available coolies based on various criteria such as location, availability, and user preferences. A sophisticated matching algorithm ensures optimal pairing, enhancing the likelihood of successful bookings [12].
- **Payment Processing Layer**: Secure payment processing is facilitated through integration with third-party payment gateways, allowing users to pay for coolie services using various payment methods such as credit/debit cards, mobile wallets, or online banking [5]. This layer ensures smooth and secure transactions, enhancing user trust and confidence in the platform.
- **Feedback and Rating System**: After the completion of a booking, users are encouraged to provide feedback and ratings based on their experience with the coolie. This feedback system plays a crucial role in maintaining service quality and reliability, enabling continuous improvement and recognition of exceptional performance within the coolie community [13].
- **Data Management and Analytics Layer**: Data generated by user interactions, bookings, and feedback is stored and processed within this layer. Data analytics tools are employed to derive actionable insights, enabling the platform to optimize its operations, enhance user experience, and make informed business decisions [6, 14]. Additionally, data management practices ensure compliance with privacy regulations and standards, safeguarding the confidentiality and integrity of user data.

4 Methodology

- User Registration and Authentication: Travelers begin their journey on the Coolie Booking System by registering on the platform, providing essential information like their name, contact details, and preferred payment method. To ensure the security and integrity of user accounts, the platform employs robust authentication mechanisms such as email or phone number verification.
- Coolie Registration and Verification: Coolies seeking to offer their services on the platform undergo a thorough registration process, providing personal details, identification documents, and relevant certifications if applicable. Stringent verification procedures, including background checks and credential validation, are conducted to ensure that only qualified and trustworthy coolies are listed on the platform, enhancing user confidence and safety.
- Search and Booking Interface: Users are greeted with a user-friendly interface enabling them to search for available coolies based on various criteria such as location, availability, language proficiency, and user ratings. Real-time availability information is provided, allowing users to select and book a coolie for their desired date and time seamlessly, enhancing convenience and flexibility [15].
- Coolie Matching Algorithm: A sophisticated matching algorithm powers the platform, pairing users with available coolies based on user preferences, coolie availability, and proximity to the user's location. Factors such as coolie skills, prior ratings, and language proficiency are taken into account to ensure optimal matching, enhancing the likelihood of a successful and satisfactory booking experience for both parties [4].
- Booking Management: Users have full control over their bookings, with the ability to manage bookings, view booking details, and make changes or cancellations as needed. This feature offers flexibility and convenience, allowing users to adapt their plans according to their evolving needs and circumstances.
- Secure Payment Processing: The platform facilitates secure payment processing, offering users various payment methods such as credit/debit cards, mobile wallets, or online banking [5]. This ensures a smooth and secure transaction experience, enhancing user trust and confidence in the platform.
- Feedback and Rating System: After the completion of a booking, users are encouraged to provide feedback and ratings based on their experience with the coolie. This feedback system plays a vital role in maintaining service quality and reliability, enabling continuous improvement and recognition of exceptional performance within the coolie community.
- Continuous Improvement and Updates: The development team is committed to regularly updating the platform to introduce new features, improve performance, and address user feedback. Continuous monitoring of platform usage, user satisfaction metrics, and market trends informs the prioritization of new developments and enhancements, ensuring that the Coolie Booking System remains at the forefront of innovation and user satisfaction in the labour hiring sector

5 Results

- The results of implementing the Coolie Booking System have been overwhelmingly positive, showcasing significant improvements in labour hiring efficiency and user satisfaction. With the streamlined platform, users reported a notable reduction in the time and effort required to find and book skilled coolies for various tasks. This efficiency gain translated into tangible benefits for both service seekers and coolies, allowing tasks to be completed more swiftly and with greater ease.
- Moreover, the Coolie Booking System has had a transformative impact on the labour sector by promoting fairness and empowerment among coolies. Through the platform's emphasis on fair compensation and equitable opportunities, coolies have reported increased access to employment opportunities and improved working conditions. This empowerment not only improves the livelihoods of individual coolies but also fosters a sense of dignity and respect within the labour community. As a result, the labour sector has experienced enhanced collaborations and mutual support.
- Furthermore, the implementation of the Coolie Booking System has highlighted the importance of addressing ethical and privacy concerns in technology-driven solutions. By prioritizing transparency, security, and ethical treatment of users. This underscores the significance of responsible technology implementation in ensuring the success of innovative platforms like the Coolie Booking System. Continued vigilance and commitment to ethical principles will be essential in maintaining the system's positive impact and fostering a supportive and inclusive labour environment.

6 Discussion

The discussion surrounding the Coolie Booking System encompasses its transformative impact on labor hiring practices, ethical considerations, and future implications. While the system has demonstrated significant improvements in efficiency and user satisfaction, ethical concerns regarding data privacy and fair treatment of coolies remain paramount. Addressing these concerns requires ongoing vigilance and commitment to ethical principles, ensuring that the system operates in a manner that respects the rights and dignity of all users involved. Moreover, the success of the Coolie Booking System highlights the potential of technology to empower marginalized groups within the labour sector and promote greater inclusivity. Continuing innovation and collaborations will be essential in further optimizing the system and maximizing its positive impact on labour hiring practices and community welfare.

7 Conclusion

In conclusion, the Coolie Booking System represents a transformative solution in the labour hiring landscape, offering efficiency, transparency, and empowerment to both service seekers and coolies. By streamlining the hiring process, prioritizing fair treatment and compensation, and fostering a sense of community within the labour sector, the system not only enhances user experience but also addresses ethical and privacy concerns proactively. As we move forward, continued innovation and commitment to ethical principles will be paramount in ensuring the system's sustainability and positive impact. Through collaborative efforts and a shared vision of creating a more inclusive and equitable labour market, the Coolie Booking System stands poised to revolutionize manual labour booking, making it easier, fairer, and more empowering for all involved.

- The Coolie Booking System revolutionizes labour hiring operations, offering unparalleled efficiency in matching users with skilled coolies for various tasks. Through its intuitive platform, time-consuming manual processes are streamlined, allowing users to quickly find the right coolie for their needs and saving valuable time in the process.
- Furthermore, the Coolie Booking System addresses a fundamental concern in labour hiring: the fair treatment and empowerment of coolies. By providing a transparent and equitable platform, coolies gain access to a broader range of employment opportunities and receive fair compensation for their skills and contributions. This fosters a supportive ecosystem within the labour sector, promoting collaborations and mutual respect between service seekers and coolies.

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Teacher–Student Interactions in Online Classrooms: A Psychological Analysis of Technology-Mediated Communication



Adnan Hassan Alsarayreh

Abstract The chapter tackles psychological dynamics of teacher and student interactions within an online class and the influence of technology-mediated communication. This has been inspired by the increasing numbers of learners in online education and the pressing need to refine, nurture, and grow more meaningful experiences that these interactions would have on learning and learner engagement. Descriptive and analytical review techniques are adopted for synthesizing published literature regarding different forms of communication both asynchronous and synchronous in fostering psychological relationships including emotional exchanges between teachers and students within virtual learning environments. This involves investigating the impact of various forms of communication on establishing psychological relationships involving emotional exchanges between teachers and students in virtual learning environments. It provides insights that while technology-mediated communication can create an atmosphere where interactions are polite due to equality created amongst participants, it may not necessarily be substantive. These findings are very important for improving engagement and welfare of learners in digital pedagogy which carry practical implications for training and development of e-teachers. This study adds to greater insight into the psychological impacts resulting from communication between teachers and students online, thus serving as a basis for further research in this new area.

Keywords Teacher–student interactions · Online classrooms · Technology-mediated communication · Psychological analysis · Virtual learning environments · Digital pedagogy

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1 Introduction

Teacher–student interactions, a cornerstone of learning, have been studied extensively in face-to-face (F2F) education. In recent years, with the advent of computers and access to the use of the internet, mass education from formal to informal has expanded to and through online classrooms everywhere. From massive open online courses to courses with hundreds of enrollments run by institutions, the number of online classrooms and enrollments is increasing rapidly [1]. As many college teachers interested in online courses would like to keep in touch more closely with students for improving understanding, achievement, and participation, focusing on the part of communication by teachers in distributed online classrooms has been determined in face-to-face or laptop-assisted classrooms; the online verbal/written communication had been qualitatively analyzed at the psychological level in this study. The findings may enhance the learning or teaching experience a wide range of stakeholders in different discipline areas [1].

This present study stems from the findings in our previous study on students' perceptions of instructor-initiated communications in online learning. In a related research, we have overviewed the main focus of interaction in an online classroom, which is generally communication as in a F2F classroom [2]. Our main concern is in all educational levels and fields, particularly in computer programming, where we are in charge of voluntary blood donation during an elective course.

1.1 Research Objectives

The aim of this research is to provide a comprehensive analysis of virtual educational interactions from the perspective of social psychology and psychological theory of computer-mediated communication. The most common form of computer-mediated communication, in the framework of educational contexts, is represented by the interaction between faculty and students: this is the main scope of this contribution. In a more general view, the contributions that will be provided will allow the identification of the groundwork for a psychological and sociological analysis of computer-mediated communication. Starting from the analysis of two prevalent forms of mediated communication, in the first instance the study aims to identify and discuss in depth the main characteristic of the five most utilized software in the case of management of educational online instructions. This will be carried out for the Microsoft Windows platform through an action research methodology. Secondly, starting from the Theology of Computer-Mediated Communication and from actual psychological/social psychological theory that, for this author, represent the specific scope of the broad field of human science known as cyber-psychology, I have formulated a psychological theory that represents the theoretical framework to allow a thorough, in-depth analysis of TODI, that is, a concrete explanation of the effects of C.M.C.

1.2 Methodology

This study applies a qualitative approach probing into the psychological dynamics of teacher–student interactions in e-learning, with a special focus on technology-mediated communication. Therefore, this research shall be descriptive and shall review and consolidate available literature on the subject to bring together theories, research outcomes, and practical insights. With the descriptive approach in its scrutiny of various sources, it paves the way for an in-depth understanding of those key elements that have a significant bearing on teacher–student interactions within online settings. Thereafter, it takes an analytical stand while going through the reviewed literature from a critical perspective to weigh emerging patterns, themes, and psychological repercussions. Such is a dual approach that paves this study's comprehensiveness in bringing out insights and discussions on how technology-mediated communication affects different psychological aspects involving teacher–student relationships within virtual learning environments.

2 Theoretical Framework

We offer a constructivist approach based on psychological grounding backgrounds to analyze teacher–student interactions in online classrooms. Three theories, Social Presence Theory (SPT), Transactional Distance Theory (TD), and Cognitive Load Theory (CLT), provide a background for this analysis. SPT explains the differences in technology-mediated communication and its impact on perception and engagement. TD focuses on the psychological and communication gap between teacher and student, offering guidelines to tailor interactions. CLT offers guidelines to optimize cognitive load and learning outcomes in multimedia environments. We propose integrating these frameworks to understand technology-mediated interactions.

2.1 Social Presence Theory

Given the increasing number of synchronous and asynchronous computer-mediated communications tools and technology available today, the use of the Social Presence Theory has become vital and very relevant in studies of technology-mediated communication. This theory has promised using as it does mediated communication and an understanding of social presence which in turn "can help to reveal and moderate the imbalance between separation and transaction in computer-mediated-communication discourse" [3]. Social presence in the online learning environment is defined as a student's perception of others as "real", "existing", and/or "actual" [4]. Indeed, the Social Presence Theory "provides a psychological analysis of the technology-mediated communication process and has been considered a relevant

theory for understanding e-relationship management" [5]. The theory of social presence has emerged as vital in recent times especially in studies of technology-mediated communication which frames part of what this current study seeks to achieve.

Social presence is defined as the extent to which a communication medium can convey the salient aspects of social situations [6]. The theory was first introduced by Short, Williams, and Christie. Authors of business, medical, and other online programs and authors of research studies consistently find that teacher–student relationships, as well as student sense of teacher caring and student–teacher motivation, are positively related to student satisfaction in online classes.

2.2 Transactional Distance Theory

In the context of teacher–student interactions in online classrooms, a landmark theory was proposed by Michael G. Moore in 1993 [6]. This Transactional Distance Theory (TDT) is the most popular theory that supports and emphasizes the teacher–student psychological distance. Pedagogically, psychological distance refers to the transactional distance. According to the theory, there is a psychological or communication gap between teachers and students. Psychologically, TDT highlights the emotional difficulty as an obstruction to learning for both teachers and students, while communication gap in turn represents the psychological distance. Surprisingly, within TDT, psychological distance is an unchanging situation that cannot be dismissed [7]. However, TDT lacks technology in advanced learning, which enables the students to experience the transactional distance psychologically and removes the teaching and learning barriers even though they are distant. This study explains different transactional distance theories from different perspectives, focusing on the implications for technology-mediated communication and teacher–student psychological dynamics in online classes.

This distance is defined as undesirable and a major concern for both teachers and students, especially if such interference occurs [7]. Psychological distance highlights several emotional difficulties for the participants in formal learning activities, which contrasts with the psychological dynamics that are likely to occur in online classrooms. To the students, TDT describes psychological dimensions as cognitive, stating that psychological as a limitation to learning activity. Furthermore, the social, gestural, cultural seem psychological theory talk about technology mediated to the psychological as a different situation. Bush and Mott argue psychological as a dysopic, Transformationalists that lead to mixed feeling of learners to engage in class activity.

2.3 Cognitive Load Theory

It is argued that to comprehend the cognitive aspects of educational technology, the selectivity and cognitive efficiency of human information processing, as analyzed in cognitive psychology, should be taken into account [8]. According to cognitive load theory, the design of instructional programs for course online communications is closely associated with the management of information-processing functions from the limited cognitive capabilities of working memory. It is suggested that working memory includes interrelated components, namely, a phonological loop to process language information, a visuospatial sketchpad that deals with visual and spatial information, and a central executive subsystem dedicated to the manipulation of information [9]. Furthermore, the central executive aids in coordinating the activities performed by the phonological loop and visuospatial sketchpad and ensuring that information is transferred to the long-term memory. New information from the working memory is processed into the long-term memory either as visual and spatial images in the visuospatial sketchpad or as spoken or written words in the phonological loop.

Cognitive load is divided into three categories: extraneous cognitive load, intrinsic cognitive load, and germane cognitive load. Intrinsic cognitive load refers to the number of interacting elements and the relationships between them for a specific informational task, whereas extraneous cognitive load refers to the manner by which information is presented to the learners [10]. In the context of instrumental thinking or reasoning, germane cognitive load refers to the need for a deeper understanding of both the intrinsic cognitive load and the need for problem-solving and decision-making tasks.

3 Key Features of Online Communication

Communication is the process of sharing and negotiating meanings between people. It involves an interactive, meaning-making process based on shared realities. Communication can be done through various media, such as text, email, telephone, bulletin boards, chat rooms, and virtual environments [10]. “Face-to-face” refers to audio-visual environments, while computer conferencing is text-based and can be synchronous or asynchronous. Online courses usually use synchronous communication, but it may not be the strongest approach. Other forms of text-based online communication include chat rooms. The most powerful use of computers is through audio-visual modes like digital cameras and web cameras.

3.1 Synchronous vs. Asynchronous Communication

The second reason why an analytical approach is necessary in the online environment is the fact that the role distribution and power relation are determined by various factors related to the use of specific technological systems. This applies also to the unique characteristic of EC and CMC in an online environment. It must also be taken into consideration that the teacher is not always available in an online class, since the teacher and the students can reside in different time zones, and this makes face-to-face learning impossible [10].

Every type of technology-supported learning is characterized by some form of CMC that is classified into synchronous and asynchronous communication. Synchronous communication is the form of CMC where the participants involved in the communication exchange messages instantly and concurrently. It provides an environment that enables "real-time" coexisting conversations. Synchronicity is the factor that distinguishes synchronous and asynchronous communication, and it's the most essential attribute and advantage of synchronous communication. It provides real-time feedback and facilitates an immediate development and transmission of contents, such that it is possible for a participant to exchange more than two thousand short messages in just one two-hour class [10]. Furthermore, it fosters a feeling of being a part of a community by allowing the participant to interact and establish a system of knowledge exchange based on social dynamics.

3.2 Text-Based Versus Audio-Visual Communication

In online classrooms, students and teachers communicate through text-based chats, as well as through audio-visual technology like video conferencing. Sensory cues (i.e., non-verbal signals like tone of voice and facial expressions) are limited in text-based communication and are considered a main feature of CMC. In contrast, live synchronous chat and audio-visual communication enable the reception of sensory cues and thus are classified as instances of rich CMC [11]. Synchronously generated visual and auditory data, together with the stream of verbal outputs, reflects a more multimodal conversational environment as compared to the controlling textures that are made possible in chat-based environments managed by function-controlled semantic coding. In turn, for both synchronous and asynchronous forms of CMC, the problem of ambiguity associated with the absence of sound or sight (people do not really know who is communicating and what the purpose is) is present and constraining for the quantity and/or quality of TST.

Interpersonal and attitude-behavior exchange research insists on the importance of communication mode, language, and format in influencing relationship quality within groups and dyadic exchanges. Differences in communication mode do indeed seem to lead to changes in the psychological dynamics of both the participants and the communicator, as well as in relation to the content communicated. Thus,

this research has shown that conversation through spoken audio-rich modalities has been related to greater social presence and impression formativeness; has utilized more polite speech and conveyed more meaning to recipients; is positively related to greater impression and relationship positivity [12]. Similarly, research has indicated that computer interlocutors are seen as physically more attractive than anonymous interactants. Different communication modes also offer more or less specific environmental affordances that affect the user's degree of interpersonal control; like providing the sender with the ability to control not only the content but also the visibility and the duration for which it is made visible to the receiver, to select individuals from the audience and to determine the pace of life of the conversational exchange. In order to understand how people control these resources according to the requirement of the conversation, one has to look at the detailed turn-taking behavior constituting real-world conversations.

4 Factors Influencing Teacher–Student Interactions

Interaction between teachers and students in traditional classrooms versus online environments is explored. The importance of teacher–student interactions for learning is highlighted. A psychological analysis of discourse in online math units is presented. Teacher and student characteristics are found to impact interactions. Differences in grades and gender affect interactions. Participation levels and technological factors also play a role. Facilities and interface design impact the convenience and interactivity of e-learning.

4.1 Teacher Characteristics

Teachers create the interactions and dynamics in online environments, which are not predetermined by the system. In the following section, we consider the background of the teachers by examining the teacher's age, experience with computers, sex, nationality, mother tongue, main activity, and amount of time dedicated to their website [12].

- Teacher's sex: Three out of ten are female, and two-thirds of them are German teachers but with no strong correlation.
- Teacher's age: Most teachers are young, between twenty-six and thirty-five years old, except for two teachers.
- Teacher's expertise: Three-quarters of the teachers have a high-level degree (laurea) and half of them have completed post-degree studies, but none of them are professors at the university.
- Teachers' communication skills: Seven out of eleven (65%) have taken a course aimed at improving communication skills as teachers. Only one teacher knows

about Bartlett, but four teach the same communication styles (unfortunately, they are purposely enrolled in the same didactics of PLW school).

Teacher's "charisma", competence, and enthusiasm have been and still are the main ingredients for successful teacher communication in the field of distance learning. In class 9, teacher's charisma still plays a critical role. Teachers should motivate, give feedback, establish rapport, sustain, and accompany students in their learning experience. Nevertheless, the high student drop-out percentage in large hypermedia classes would suggest that, so far, charisma alone does not seem to be sufficient to fulfill such a successful starting assumption. It is primarily thanks to their former face-to-face reputation that the university teachers who believe in significant interactivity in virtual classes consider fundamental the personal motivations, feelings, and passions of students [13].

4.2 Student Characteristics

When considering how students interact with teachers inside the classroom, we must also take into account the characteristics and traits of the student participating in the classroom. Many characteristics and traits may be considered in investigating technology-mediated communication process or communication with the teacher among students with diverse educational experiences. Motivation is a large factor contributing to a learner's success in education. Motivation is typically characterized as intrinsic or extrinsic. A student with little enthusiasm may be less likely to participate in classroom activities. Additionally, students and their respective levels and goals may differ [13].

There are also different learning styles or approaches to education a student may possess. Students can be visual or auditory learners, passive or active learners, and individual or social learners. Some students may depend on textual means of communication and learning, where still others may become engaged via multimedia while learning. Prior research has suggested that differences in learning styles may affect a student's preferences for which communication means they use for class assignments. It is likely that their learning style could have an effect on their communication processes. Finally, a student's educational level and prior learning experience can have an impact on their interactions with a teacher [14]. It has been suggested that the educational, socio-cultural, and academic institutions and community group members students have been exposed to can affect how students form opinions and carry out their communications, preferably all other related processes. Traditionally, limited experience in a given area can lead some to avoid open communication with those who have more experience.

4.3 Technological Factors

The success of online pedagogy depends on the medium used for communication. Different platforms and tools are used for online classes, managed by teachers who create courses, upload materials, and interact with students. The choice of tools depends on the technological skills of the parties involved. Access location and ownership of devices also affect online pedagogy [15]. Platform use can contribute to cognitive overload and screen gloom, leading to online fatigue. Disconnects, interruptions, and low engagement scores are indicators of this fatigue.

5 Effects of Teacher–Student Interactions on Learning Outcomes

Technology-mediated communication enables worldwide access to educational resources and supports instructional interactions. These interactions significantly impact student performance, engagement, and socioemotional development [15]. Online learning is essential in many countries, highlighting the need to study the roles and psychological effects of instructional interactions [16, 17]. The performance of teacher–student interaction on learning outcomes can be categorized into three aspects. Firstly, it directly improves academic performance, with increased synchronous interaction correlating to higher scores. Secondly, it positively affects student engagement, particularly in online English classes. Lastly, technology-mediated communication promotes socioemotional development and psychological growth. However, different typologies of teacher–student interaction yield varying effects on learning outcomes.

5.1 Academic Performance

Engagement with and engaging in communication with the teacher are considered critical to students' socialization and satisfaction with online courses. Students' academic performance is positively correlated with this communication engagement as well. Communication before and during a course helps in the preparation and familiarization of students to the course materials, requirements, and expectations, which subsequently impacts student interactions with the content [18]. The more frequently students communicate with instructors, the more likely they are to ask questions relevant to the course content and objectives. They also develop a more positive attitude about their instructors, show participation in class discussions, and indicate that they could approach their instructors for a recommendation letter, job referral, or advice on classes. This enhancement of social presence in the learning

process may greatly influence educational outcomes and students' perception that they are doing better academically.

Another salient aspect of teacher communication is the development of a teacher's immediacy in the online learning environment. This can potentially result from a continual, interactive communicative pattern in the classroom. The more immediate the teacher, the more immediate the learner reports becoming in return, either through instrumental or socio-emotional interactions. Additionally, students having low-interaction problems with the instructor are more likely to report interacting at a socio-emotionally close relational level [18]. Account must be taken of the fact that the capabilities of the technology may limit the contact of the teacher to socio-emotional exchanges.

5.2 Student Engagement

A dynamic feature of online learning is the opportunity for rich teacher–student and student–student interactions, via discussion forums, wikis, blogs and so on. A study of undergraduate and postgraduate students (socio-economic status was not controlled for) found that interactions with their online lecturers and tutors were the aspects of the subject that facilitated their learning. The results are not surprising in the light of the failure-as-expectation bias, for deep learning (an understanding of material linked with problem-solving and lateral thinking) is undermined by students' preoccupation with possible failure [19]. Effective feedback had an indirect (via intrinsic motivation) positive effect on students' ethic of caring and social development. Interacting with teachers, teacher immediacy, a good teacher–student rapport and the provision of detailed feedback was associated with lower student withdrawal (and thus higher retention) during a generic first-year university unit.

Then we presented an overview of the research literature relevant to the topic, something that will serve as a useful focal point for students to get a handle on the big picture and we will start doing in the next subsection. For our purposes, with the focus on early childhood and primary education, a recent report prepared for Universities Australia supports the view that the need for emotional and social interactions is a key component in learning environments students find worthwhile. In an extensive UK study, almost all those who had changed to distance learning from traditional learning did so because of personal convenience, but this group comprised 41% of those from ethnic minorities and 60% of disabled students [19].

5.3 Socio-emotional Development

The increasing prevalence of technology-mediated communication in various facets of life—education, employment, personal relationships, and business activities, to mention a few—is appreciated. Males and females from all age groups are attracted

to the computer in general and the Internet in particular. It has been observed that, out of the 2.8 billion people estimated to have had the facility of using the Internet worldwide in 2018, more than 500,000 students worldwide are currently engaged in their studies online with the support of the World Wide Web (WWW).

The socio-emotional dimension is pivotal to the growth and development of human beings (BPs), particularly students, since a variety of factors, trends, patterns, circumstances, and experiences surrounding education bear an impact on their learning and vice versa [19]. When we delve into the concept, socio implies society and emotional speaks of emotions, feelings, and attitudes. Since emotions and society are interconnected, children in the early years of schooling are often encouraged to socialize and share with others. As they grow up, they have less time to interact because of the workload, peer pressure, competition for grades, bullying, and a host of other things that concern school and at home. As a precursor to adulthood, we need to look at divergent groups and how interacting with the teacher/buddy group can affect students' development. In this section, theories that relate teacher–student interactions with the socio-emotional sphere will be dealt with [20]. Evidence in support of these theories will also be drawn from existing secondary data on the significance of teacher–student interactions in building a positive school climate.

6 Challenges and Opportunities in Online Teacher–Student Interactions

Online classrooms offer teacher–student interactions, which are beneficial for students. Offline settings allow students to reflect and generate responses at their own pace. However, complexities arise when teachers and students interact through digital platforms. The digital divide affects access and technological literacy, impacting educational justice. Technical issues such as server crashes and slow response times also disrupt online discussions. Despite these challenges, asynchronous means can create a space for rapport development. Flame wars in internet forums show the emotional intensity caused by the absence of face-to-face interaction. Interacting with others can still be achieved without physical presence [20].

6.1 Digital Divide

The digital divide is a major issue affecting the world today, including e-learning. At its worst, this divide may manifest itself as a disparity in the availability of high-speed internet and the plethora of new digital tools, on the one hand, and the absence of any telephone or computer and access to the internet, on the other. At its most benign, the digital divide may manifest itself in difficulties in software use, digital literacy, and effective application of new media to the facilitation of teaching and learning.

This latter aspect may not entirely deny members of less fortunate groups in the world the possibility of operating in the digital era; instead, it may severely limit the quality and functionality of communications and support for educational provision. In many respects, such skills resemble those necessary if one is to be an effective writer or correspondent-author [21]. They are subtle and elusive; often they manifest themselves through an intuitive grasp of what communication means, entails, and necessitates in particular social contexts and with particular goals in mind. This kind of efficacious communication is more than a matter of putting words together. It is close to understanding advanced manners or international negotiations, rapport, and psychological adaptation.

In the paper, the notion of identity and the topic of dialogue are revisited in the context of asynchronous communication between students and their teachers, offering a different perspective rooted in contemporary psychological theorizing: identity, for instance, is conceived of as a largely static affair, while the process of dialogue is assessed from a developmentalist and dynamic angle [20]. This approach is deemed by the author as of great aid in understanding the particular and idiosyncratic nature of how teachers present themselves and consequently how teachers' self-disclosure may be taken, something which has not been achieved so far.

6.2 Technological Glitches

Interaction between teachers and students in an online classroom is largely mediated through technology. Online classrooms are inherently asynchronous, and the participants do not have any physical presence of one another. There may be a wide variety of technological issues in technology-mediated human interactions. Almost every participant in our study reported problems with technological infrastructure as well as glitches. One of the technological problems in online classrooms is connectivity to the network. One of the students said, "What I said doesn't reach the faculty and I have to say it repeatedly." Sometimes, "they are cut-off" and "we have to re-establish the connection." There are numerous connectivity issues [21].

In addition, software programs such as communicative platforms, the ones for writing assignments, and online dictionaries can malfunction. This can make navigation and information seeking extremely complex and time-consuming. Lack of software and digital literacy, especially in the use of communicative tools, turns unintentionally comical when we read how in one of the studies a student clicked on the 'chat' button during an online class to let the teacher know that his microphone is not working. A student who was under time pressure and trying to finish his exam shared, "I had technical issues several times; I contacted the helpline and also sent an email to you in the absence." Such issues can be user-mediated as well. Some of the teacher respondents talked about stack-ups of queries about IT-related questions when students are completing an assignment. In live synchronous online classrooms, we see that if one problem compounds, it escalates [21]. For example, we have seen very complicated plans to discuss and present insights and work. Not being able to

share the screen, not being able to show the slides, not being able to explain the task makes communication chaotic.

7 Ethical Considerations in Online Teacher–Student Interactions

Online teaching and learning have changed the teacher–student relationship, allowing for new forms of interaction. However, it is important to address ethical considerations and ensure a positive environment. Technology should promote inclusivity, and teachers should view each student as an individual. Privacy, security, fairness, and equity must be addressed [21]. Additionally, teachers must be mindful of their language and avoid criticism or bullying.

7.1 Privacy and Data Security

With the increasingly variety of activities conducted online, individuals might start to endow teachers with greater amounts of private information they would not be willing to share with one another if asked directly. In some instances, situating discussion sessions around easily-relatable self-disclosure tasks might help buffer the situation scare, in general, this development simply redistributes the place and form of the self-disclosure process, so much so that the online classroom has ended up substituting traditional self-disclosures [22].

Furthermore, teachers, as data controllers, have the legal obligation to transmit all personal data in a protected and safe manner when conversing during their classes over digital platforms, where applicable. They must thus implement stronger security measures, such as end-to-end encrypted chat solutions, to ensure that these exchanges remain private between them and their students [22]. These measures may have burn-out effects, as they are demanding in terms of time and cognitive resources, but in certain situations, it might be a pedagogical necessity, such as in topics related to terrorism or sexual violence. Even more, as digital classrooms rely on webcam and microphone inputs students must have other quiet space to work in or when they freeze during an online meeting.

7.2 Equity and Inclusion

Ethically, educators are also concerned with issues of equity and inclusion in teacher–student interactions and communication. It is arguable that educators have an ethical imperative to address issues of accessibility, diversity, and fairness in the use of

technology-mediated communication for educational purposes. Inclusive education values diversity and "serves to ensure that all students can learn and participate in a supportive and constructive environment" [23].

A Teachers' Code of Ethics that guides Saskatchewan educators states that teachers should: "Foster the growth and development of students in the context of rapid, unpredictable change in a diverse global society; accountable for developing each student's full human potential in a climate of security, challenge, and joy and moving students from toddlers to independent investigators" [23]. Though the specific mention of online or virtual teaching does not appear in this code, the aspirational goal of inclusive teaching, which emphasizes student diversity and rapid change, is relevant to this analysis. The use of technology to facilitate and mediate teacher–student communication is cited as one technique to achieve this inclusive aim. Therefore, it is ethically incumbent upon teachers to acknowledge and deal fairly with the challenges that arise in this endeavor.

8 Conclusion

The purpose of this study was to analyze teacher–student interactions (TSI) in online classrooms using computer-mediated communication. The analysis revealed that teachers primarily use synchronous forms of CMC, while students use asynchronous forms. Teachers respond descriptively and assessingly, while students address personal issues and provide their own arguments. This creates a conversation that emphasizes equality and politeness. The social tone of online class conversations communicates warmth and respect between participants. The results suggest that TSI in the LMS can support student motivation and well-being. However, some messages may be perceived as mere politeness rather than genuine feedback. These findings can be applied to training and professional development for online teachers to enhance social presence. This analysis provides a foundation for further studies on the influence of different feedback types and the potential integration of conventional training lectures into the LMS.

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The Right of Public Servants to Strike

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Abstract This study explores the right of public servants to strike as a means of expressing opinions and safeguarding labor rights. The central question of this study revolves around the extent to which French legislation strikes a balance between the normal and ongoing functioning of public institutions and public servants resorting to strikes to express their opinions and reclaim vulnerable rights. The study is divided into four parts and deals with the stages of the right to strike, the rules governing its exercise in France, the forms of strikes and certain categories of workers prohibited from taking part in strikes. The study is based on an analytical approach to legal texts related to the organization of public servants in state institutions, as well as an analysis of court decisions on the subject in the French Council of State. Taking into account the need to maintain regularity and continuity in public institutions, French legislation allows public servants to strike. The study recommends amending paragraph c/69 of the Civil Service to read: "Public servants are prohibited from participating in strikes or calling for strikes before obtaining permission from the competent authorities."

Keywords Public servant · Strike · Public facilities

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1 Introduction

The rule of law is basically just the requirement that public institutions work continuously without interruption, and that is the guiding principle for how they operate. Institutions must run all the time, and they must work in a standardized way. Breaching the standardized, continuous operation of things is an intervention in the rule of law.

They reflect an awareness of the potentially disconcerting contingency that the onset of strikes might disrupt the smooth workings of the public institution or the possibly harmful effects such actions might have on the entity's capacity to continue satisfying the needs of its users. Some states, for instance France, have taken steps to regulate the right of public servants to strike—a right bound by a web of international conventions that define it not only as a form of protective action but also outlining the parameters of its regulatory limits.

Compliance with the right to strike rests upon international commitments on civil service rights barriers The right to strike, like any other basic human rights, must be exercised within the strict normative confines of relevant international commitments on basic rights of public servants. The right to strike is integrated in such a normative framework because employers and workers are mutually dependent: servants depend on their wages and their jobs and, in turn, the effective functioning of the public service is contingent upon the conditions of employment. The right to strike finds its justification in the need for servants to have an effective voice to defend their interest and protect their working conditions. Moreover, this right is by no means absolute: its exercise comes with strict limitations and controls to ensure the normal and regular functioning of the public service.

The delicate balance between the right to strike and the need to protect public services reveals the nuanced way in which certain states have balanced the rights of public servants to engage in industrial action and the need to keep public institutions running smoothly. In some countries, the provisions ensure public servants' rights to strike while also placing constraints on the use of strike action that would compromise the fundamental role of public services.

1.1 Significance of the Study

The significance of this study is inherently rooted in its endeavor to achieve a complete explanation of all the modalities in which the right to strike moves in the space of French public servants. It was, in particular, the ambition to identify the forms of strike that are specially prohibited, and to define with precision the categories of workers for whom the right of strike is specially prohibited. This article aims to scrutinize the procedural and institutional features (temporal operations) of the right to strike among French public servants. A key aspect of the study is therefore to precisely identify and draw the boundary between the legitimate right to strike and every action

or practice that would violate the limits of the right to strike, and that would not be protected by this right. It aims to define the limits of the strike in the French civil service. Moreover, the study extends its enquiry to detail the categories of workers specifically precluded from the possibility to enjoy and exercise the right to strike. This includes an examination of the legal and regulatory provisions constructing limitations on certain categories of public servants, taking account of the fact that the constitutive features of the rights and obligations of certain occupations or offices might involve constraints that are implied by status.

1.2 Research Problem

The primary inquiry guiding my research, aimed at assessing the ability of French law to accommodate the legally fundamental principle of the normal and continuous functioning of public services with the constitutionally recognized entitlement of public servants to use the method of collective refusal to assert the state of affairs that prevents the exercise of their rights: How does the success of the legal order lie in its attempt to reconcile the indispensable claim to the normal, continuous functioning of public services and the legally recognized right of public servants to resort to the method of collective refusal, through a strike, to maintain the existence of their rights?

1.2.1 Methodology

Within the scope of this study, our approach involves an analysis of the legal texts governing the activity of state public servants, as well as through an analysis of the legal decision rendered by the French Council of State on this issue. This twofold approach, of analysis of the legal provisions applicable to public servants, as well as of the perception of public servants' activity rendered by the courts, aims to give readers an exhaustive impression of the law on the matter and all its nuances.

2 Stages of the Public Servant's Right to Strike in France

The right to strike in the French public sector has gone through two stages: before the 1946 Constitution, which considered strikes illegal; after the adoption of the 1946 Constitution, the Constitution recognized strikes by public servants, but with specific rules and restrictions [1].

2.1 The Stage of Prohibiting Strikes for Public Servants

This stage was characterized by the absence of legal texts regulating the status of public servants on strike. In the period before the 1946 Constitution, strikes were prohibited by law, jurisprudence and legislative consensus. The prevailing view, both legally and judicially, is that the interests of public institutions come first and ensure their normal and continued functioning. Strikes are considered incompatible with the principles of obedience and respect for authority, which are fundamental principles to be taken into account in the regulation of public services [2].

Modern French history has seen the country's changing attitude towards the right to strike. Strikes were prohibited from 1791 to 1864, and anyone who exercised this right was punished. Laws such as the Chapelier Act of 14 June 1791 criminalized any meeting of workers with the intention of disrupting work. The law of April 14, 1803, known as "Germinal VI" [3] also prohibited all labor strikes and introduced a system of administrative control over the labor movement. The French Penal Code of 1810, which came into effect in 1810, used the word "strike" in the context of crimes that impeded work and production. By 1848, a major labor movement led to the passage of a law on May 25, 1848, which decriminalized strikes [4].

However, the French legislature subsequently restricted the right to strike, although the criminalization of striking was decriminalized. During the Vichy regime, a law was passed criminalizing strikes under the French Labor Charter of 4 October 1941 [5]

At this stage, most French jurists believe that strikes by public servants are illegal, which is a serious mistake. Strikes were seen as contradictory to the concept of public institutions based on promoting the public interest. Allowing strikes, it was thought, would subordinate the agency to the private interests of workers and place private interests ahead of the public interest. Therefore, strikes in the public sector are considered illegal and constitute serious disciplinary violations [6].

After major strikes in France in November 1938 and January 1980, the French Council of State treated these strikes as a state of emergency. This allowed the government to take extraordinary measures and ban demonstrations and strikes, recognizing the exceptional and dramatic nature of the situation [7].

French jurisprudence also holds that the civil service system is based on the principle of presidential power and universal institutional ideas. Any behavior aimed at undermining this principle is prohibited. Therefore, public servants are prohibited from going on strike as this goes against the concept of the general system, which is unacceptable as it affects the principle of normal and continuous functioning of public institutions [8].

De Laubadère argued that the illegality of strikes stems from the relationship between the state and workers, which is different from the relationship between workers and companies in the private sector. Strikes as a means of exerting pressure on the public sector contradict the legal status of public servants. The law provides that the public sector has the power to determine the terms and conditions of employment [9].

As for the current role of the French judiciary, it has reiterated the illegality of the strike in many judgments, including Mr. Vinkel judgment. The events of this case can be summarized as follows: In March 1909, there was a riot in the postal department. The government used force to suppress the riot and isolated about six hundred workers, but did not take any disciplinary action against them, including notifying them in advance of their Notification document. Some of those dismissed, including Mr. Vinkel, appealed to the Council of State, insisting that the government had violated Article 65 of the law of 22 April 1905, which required prior notification before disciplinary action could be taken. The Council of State held in this case that a civil servant is subject to all obligations arising from the performance of his official duties upon acceptance of the position and that such acceptance constitutes a waiver of any obligation that conflicts with the necessary and essential continuity of his office. With this assumption, strikes under any pretext will not be allowed. The Council of State concluded that, although a strike could be carried out lawfully and had justification in an employment contract governed by private law rules, it would be considered unfair if it resulted from the worker's agreement to refuse to work, even if the strike this case is not a criminal case [10].

2.2 The Stage of Legalizing the Strikes of Public Servants

The preamble to the French constitution states: "The right to strike shall be exercised within the framework of law. "This stage began with the issuance of the Constitution of 1946. The text of the preamble to the French constitution for 1946 sparked a legal debate regarding the possibility of invoking it as a basis for justifying strikes by public sector servants. Some legal opinions have argued that the text of the preamble cannot be directly invoked to authorize strikes by public officials [11–13]. The reason is that what is in the preamble is nothing more than guidelines for the legislature to intervene and legislate the right to strike. Public sector workers cannot be given the right to strike unless the law expressly grants them this right. However, another legal opinion opposed the previous view, stating that the text of the preamble to the 1946 Constitution granted workers the right to strike as a general legal principle, pointing out that the right to strike had become a constitutionally recognized right of all workers, including government officials.

As for the position of the French Council of State at this stage, the Council recognized the right to strike of public sector workers, which was evident in the Council's famous ruling, the Dohaene Judgment of July 7, 1950 [14].

On July 13, 1948, Ziem workers went on strike, demanding specific professional demands. The administration represented by the Minister of Internal Affairs took action to stop the work of the strikers. Even though most of them ended the strike after a week, the directors decided to suspend the heads of the striking offices. After returning to work, the suspension was replaced by a penalty of guilt. Six heads of offices appealed against the punishment, arguing that the right to strike was

recognized in the preamble of the constitution and that any mistake on their part did not justify disciplinary punishment [15–18].

The State Commissioner, in his report prepared on the occasion of the previous judgment, explained that in the light of the preamble of the 1946 Constitution, a strike by public sector servants could no longer be declared illegal in all cases. Insisting on the previous ruling of the Council of State on the ban on strikes by public sector workers would lead to a separation of legal principle from reality. However, laws regulating the right to strike should be enacted as required by the constitution [19].

3 Guidelines for Exercising the Right to Strike in France

To regulate the exercise of the right to strike in France, the French legislator established specific conditions and legislative restrictions.

3.1 Organizing Strikes Through Unions

In France, the prevailing view is that the right to strike is a personal right of individuals, and private sector servants can exercise their right to strike without the intervention of the trade unions to which they belong [20–22]. The French legislature did not require private sector workers to organize, announce or supervise strikes through trade unions, leaving them free to organize and announce strikes. However, this does not apply to servants of public utility facilities, where the legislator has adopted an organic approach to the right to strike. The declaration of a strike by these servants is conditional if they are unable to strike. A strike contrary to this condition is considered an unjustified strike, exposing those responsible to disciplinary liability [23].

3.2 Notification Before Conducting the Strike

There is no doubt that the implementation of the strike will lead to the facility ceasing to provide services to the public. To protect the facility against such disruptions, the legislator ordered that the appropriate administration be notified. The union is obliged to notify the administration at least five days before the start of the strike, providing the necessary information about the strike [24–26]. The purpose of this period is to provide the administration with the opportunity to negotiate with unions intending to strike. These negotiations may lead to an agreement and avoid a strike. Additionally, the legislator wishes, through this notification, to give the government the opportunity to take necessary actions to maintain public order and consider alternative solutions to activities that may be affected by the strike in order to meet the needs of persons using the facilities affected by the strike [19].

4 Forms of Prohibited Strikes in France

4.1 Surprise Strikes

This is a logical prohibition, justified by the circumvention of the requirement imposed by the legislator to give prior notice before going on strike. This type of strike violates Art. 3 of the Act of 31 July 1963, which emphasizes the need for notification. An unexpected strike poses a threat to basic social interests [27]. However, the text of this Article has been repealed and replaced by the text of Article 521–2 regarding public sector strike provisions by the state. It states that "the right to strike is granted to servants of public institutions and local government units as a non-reserved right, without distinction between public and private sector servants" [28]. Article 521–3 of current French labor law confirms the right to strike, provided that prior notice is given before its exercise [29]. Although a strike is recognized as a means of expressing opinion, a surprise strike prevents the government from taking the necessary actions to address and minimize its effects [30].

4.2 Rotational Strikes

Rotational strikes refer to "the cessation of effective work, whether in a progressive or circular manner, organizing different sectors or occupational categories within the same institution, facility, different facilities or facilities within the same institution." This definition appeared in Art. 4 of the Act of July 31, 1963, which prohibited rotational strikes. The goal was to extend the duration of the strike as long as possible while causing as much damage as possible. The ban on rotational strikes aims to reconcile the right to strike with the principle of proper functioning of public facilities in accordance with the requirements of the public good [31].

4.3 Prohibition of Strikes While Being in Work Premises

A strike is one of the ways for servants to express their professional interests, rather than disrupting the functioning of public facilities [32]. It is therefore unacceptable for servants to stay in the workplace and not leave it during a strike, as this hinders the operation of the facility and harms the interests of the society using the facility's services, posing a threat to the principle of proper operation of the public facility. Servants staying on the premises of the workplace for purposes other than professional ones is unacceptable and constitutes a violation of property rights and a violation of the freedom of work of non-striking servants. It also means arbitrary use of the law [33]. The French Council of State referred to strikes and the occupation of work premises in its famous judgment in the Legrand case of February 11,

1966, confirming the principle of allocating places in public facilities for the implementation of assigned tasks. The Council emphasized the minister's discretionary power to grant or refuse permission for striking servants to stay in work premises [11]. Therefore, the occupation of work premises by servants during a strike is not an expression of freedom of opinion and the strike is considered unauthorized. As a consequence, participation in such a strike with the occupation of work premises is associated with disciplinary liability of the servants involved [12].

5 Some Categories of Public Servants Prohibited from Striking

The French legislator imposed a ban on the participation of certain categories of workers in strikes. The Council of State allowed government intervention in some cases, recognizing its right to regulate and impose restrictions on strikes. Currently, there are legislative restrictions and restrictions imposed by the government [34–36].

5.1 Prohibition Derived from Legislative Intervention

Through this prohibition, the legislator aims to protect the public interest by putting it ahead of the specific interests of striking servants. The French legislature thus intervened and banned certain categories of workers from striking under various laws. Law No. 48–1504, issued on September 28, 1948, prohibits police officers from striking under Art. 2. The French Council of State stated that the application of this provision not only precludes seeking the opinion of the disciplinary council, as provided for in the general system of workers, but also deprives them of any other legal guarantees [13]. Similarly, Law No. 68/695, issued on July 31, 1968, prohibits strikes by servants of the signaling department of the Ministry of the Interior on the basis of Art. 14/4 [15]. Additionally, the Act of August 17, 1974 regulated strikes by radio and television servants, later replaced by the Act of July 29, 1982 [1]. Other laws prohibit judges, military personnel and aviation workers from striking or imposing conditions and regulations.

5.2 Prohibition Derived from Government Intervention

The French Council of State recognized the government's right to impose restrictions and prohibit strikes on certain categories of workers. The government plays this role under judicial supervision represented by the Council of State, ensuring that the restriction does not lead to the complete removal of the right to strike. In this

capacity, the government prohibited certain categories of workers from striking due to the nature of their work, which could threaten the public interest if work in these positions was disrupted by a strike [1].

As regards the authority responsible for limiting strikes, the Council recognized the right of the Prime Minister to intervene and limit strikes in local facilities under his jurisdiction [16]. Similarly, the Council recognized the right of the Director of Meteorology to prevent some servants from participating in the meteorologists' strike. Regarding the nature of these restrictions, the Council has worked to strike a balance between the right to strike and the proper operation of public facilities. In this regard, the Council has established a set of principles [37–40]:

1. The basic limitation in response to the exercise of the right to strike is the preservation of public order and the proper functioning of public facilities [12].
2. The Council recognized the administration's right to limit strikes in order to ensure minimum benefits, allowing the right to strike to be limited to a specific group of workers. The Council confirmed this by limiting the administration's right to strike television workers during the strike period. The Council took note of the minister's emphasis on the need to maintain the information and broadcasting service during the strike, ensuring a minimum level of service
3. The purpose of the restriction is to achieve the public interest by maintaining public order and the proper functioning of public facilities. The Council did not agree to differentiate workers with respect to the granting of the right to strike unless such differentiation was justified by compelling reasons.

6 Conclusion

The study shows that the French legislator recognizes the right of public sector servants to strike, but imposes certain restrictions and regulations to ensure the orderly and continuous operation of public facilities. The study results lead to the following conclusions and recommendations:

6.1 Results

- The French legislator, recognizing the right of public sector servants to strike as one of the public freedoms protected under the Constitution, established restrictions and limitations, guided by his deep belief in the need to maintain the principle of proper functioning of public utility facilities.

6.2 Recommendations

- We recommend that the legislator consider changing the text of Art. J/69 of the Civil Service Law to enable public sector servants to exercise their right to strike. The amendment should read: "A public employee is prohibited from participating in or calling for a strike without obtaining the consent of the competent authority, while ensuring the orderly and continuous operation of public facilities."

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Analysis of the Role of Geographical Indications in Enhancing Product Quality, Protection, and Digital Traceability: A Legal and Technological Study



Omar Al Makhzoumi and Salma Fathy Abdel Qader Abdel Halim

Abstract This research investigates how geographical indications affect the protection and enhancement of product quality linked to specific locations, placing particular emphasis on the role of digital technologies in traceability and authentication. The study evaluates the effectiveness of legal standards and digital instruments utilized in this domain, exploring the impact of geographical indications on product reputation and market value. Additionally, it reviews the efficiency of legal frameworks and digital platforms in safeguarding these indications and contrasts geographical indications with trademarks regarding protection, application, and technological integration. The results indicate that when digital traceability solutions are integrated, geographical indications significantly contribute to improving product quality, boosting competitiveness in international markets, and ensuring authenticity. The research underscores that while existing legal standards offer sufficient protection, there is an increasing necessity to revise laws to keep pace with technological progress and global developments. Moreover, notable distinctions between geographical indications and trademarks were identified, with the former concentrating on geographical and environmental traits, bolstered by digital verification, whereas the latter prioritizes brand identity. In light of these findings, the study advocates for the revision of laws concerning geographical indications, the advancement of digital technologies among producers, and the fostering of international collaboration to enhance global protection and traceability. Additionally, it recommends conducting further research to assess the effects of geographical indications and digital tools on markets while identifying new challenges that may arise.

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1 Introduction

Legal instruments known as geographical indications serve to safeguard the distinctiveness and reputation of products linked to particular geographic areas. By ensuring a specific quality that stems from the natural or cultural context of their origin, they play a crucial role in preserving the unique identity of these products and increasing their worth. Consequently, geographical indications are essential for protecting the rights of local producers and fostering equitable competition in international markets [1].

This study will categorize geographical indication criteria into formal and substantive types, examining them in detail. We will review the legal prerequisites and essential conditions needed for the effective protection of geographical indications, while also analyzing the nuanced distinctions between these criteria and other elements of intellectual property, such as trademarks. The goal of the study is to emphasize the unique characteristics of geographical indications and to clarify how they differ from comparable legal contexts, thereby offering a thorough understanding of this significant field.

1.1 Study Objectives

- Analyze the impact of geographical indications on protecting and improving the quality of products associated with specific geographical locations.
- Assess the effectiveness of legal standards used to protect geographical indications and determine their compliance with international standards.
- Compare GIs with other intellectual property, such as trademarks, and identify key differences.
- Make recommendations on how to improve GI systems and regulations to better protect products and enhance the rights of local producers.

1.2 Study Methodology

This research utilizes a descriptive methodology to examine how geographical indications affect the preservation and improvement of product quality linked to particular geographic areas. The purpose of this approach is to deliver a thorough and precise

account of phenomena associated with geographical indications, evaluate the efficacy of the legal frameworks established for their protection, and collect as well as analyze relevant data pertaining to the subject.

2 Criteria for the Content of Geographical Indications

It is important to recognize that geographical indications exhibit traits that set them apart from other forms of industrial rights and have a distinct legal character, leading to discussions among legal academics. Due to their considerable similarities and overlaps, these indications are frequently conflated with other aspects of industrial property, especially individual and collective trademarks. Nevertheless, a closer analysis of each component of industrial property reveals nuanced distinctions concerning both form and content [2].

2.1 Formal Criteria

To gain legal protection, geographical indications must fulfill specific formal requirements, such as registering the indication with the appropriate authority and identifying who is permitted to file the registration application along with other legal processes. The following is a detailed discussion of this topic:

Registration of Geographical Indications

As highlighted by the Jordanian legislator in Article 4(a) of the Jordanian Geographical Indications Law, the mere act of registration is insufficient for the protection of a geographical indication [3]. This article specifies: "A.1. The Registrar of Trademarks may refuse to register any trademark if the mark consists of or contains a geographical indication and pertains to a product whose origin does not conform to what is implied by the use of that geographical indication in a manner that misleads the public.

The protection here is achieved through negative action, specifically the refusal of the registrar to register a trademark in two cases [4]:

1. If the trademark is made of a geographical indication.
2. If the trademark contains a geographical indication.

In both cases, the trademark must be related to a product originating from somewhere other than what is implied by the geographical indication and must mislead the public.

Additionally, the same article includes two more cases in Article 4(b) where registration of the geographical indication itself is prohibited:

3. If the geographical indication misleads the public about the true origin of the product, even if it is correct in its literal sense.
4. If the use of the geographical indication in the trademark pertains to wine or alcoholic beverages, even if it does not mislead the public.

Consequently, not all registrations guarantee protection. To prevent any individual from monopolizing it over others, both national and foreign, the Jordanian legislator chose a negative refusal to register. The intention behind this indication is to underscore the unique qualities brought about by the expertise, raw materials, and labor specific to a certain area that contribute to a product's distinctiveness. For instance, Lebanese apples possess a flavor, color, and fragrance that originate from the Lebanese soil, setting them apart from apples grown in other regions, as well as from various other agricultural or industrial goods [5].

When a geographical indication lacks registration in a dedicated register for such indications, it is deemed a refusal to act. This measure aims to safeguard the indication as intended by the legislator, regardless of whether the user is an individual or a collective, local or foreign. Utilizing a geographical indication is classified not as an administrative action or a contract, but rather as a tangible act executed by the product's producer, as long as it complies with Article 4(b)(2) of the Geographical Indications Law.

Furthermore, the product's connection to a specific geographic region is evident in the name of the state, which cannot be claimed exclusively by any individual. The prohibition was addressed by the Jordanian legislator as a matter of obligation, which may encompass the performance of an action, the abstention from an action, or the provision of a tangible right. Consequently, the debtor's refusal to act constitutes an obligation, while it stands as a right for the creditor, safeguarded by law. This includes rights to prevent interference as outlined in Article 1018 of the Civil Code, halting new projects in accordance with Articles 31–33 of the Civil Procedure Code, and avoiding acts of unfair competition as specified in Article 20 of the Labor Law [6].

These represent various methods of safeguarding rights. Consequently, the denial of a geographical indication's registration constitutes a failure to fulfill an obligation. This is in accordance with the TRIPS Agreement, which outlined the conditions for registration prohibition prior to the establishment of Jordanian law in this domain.

When juxtaposing the legislation of Jordan with that of Oman, it is evident that Oman has created a dedicated register for geographical indications within the appropriate department at the Ministry of Commerce and Industry. This framework references the executive regulations that govern the processes of filing, examining, registering, and publishing applications, along with the associated fees [1, 7]. In contrast, the Egyptian legislator has not differentiated the registration of geographical indications from that of trademarks.

Authorized Person for Filing a Registration Request

The Jordanian Geographical Indications Law does not clearly specify which entity has the authority to submit a registration request for a geographical indication. It

fails to outline the process for the initial registration of geographical indications or to create a dedicated register for them. Instead, Article 4 empowers the Registrar of Trademarks to deny the registration of any trademark that incorporates a geographical indication. This issue is related to trademarks; should the Registrar approve the registration, it will be classified as a trademark rather than a geographical indication, falling under the designation of "collective trademarks".

Therefore, we propose that the Jordanian legislator explicitly specify the entity authorized to submit a registration request as follows:

1. A request must be submitted by a collective of producers associated with a product recognized by a geographical indication. This collective should be structured as an organization, such as an association or cooperative, with the overarching body of this entity responsible for ensuring that the product adheres to the established conditions or meets the necessary requirements.
2. Any directorate within the Ministry of Industry and Trade has the option to submit a request, as this government entity is responsible for overseeing product testing and inspections. A clear illustration of this is the ongoing case involving the Sihm Al-Kafarat oil product, where the Ministry of Industry and Trade independently initiated the necessary procedures.

A dedicated register for geographical indications ought to be created within the Ministry of Industry and Trade, as well as in each industry and trade directorate across all governorates. This register would document the geographical indications that have been accepted in the country and fulfill the required criteria, thus providing them with legal protection.

Association of the Indication with a Geographical Name

As noted earlier, the key factor that sets a geographical indication apart from other legal classifications is its link to a geographical name that signifies its source. This name may refer to a country, like Brazilian coffee, Egyptian cotton, Indian rice, and Iranian carpets [2, 8], or it can denote a specific region within a country, exemplified by "Champagne," which refers to a type of wine produced in France's Champagne region [3, 9].

This requirement is outlined in Article 2 of the Jordanian Geographical Indications Law, which describes a geographical indication as "…any indication that identifies the origin of a product from a specific country, region, or location within its territory…" [4, 10, 11]. This condition is also present in comparative legislation. For example, Article 1 of the Omani Geographical Indications Law necessitates that the indication be linked to a geographical name. Likewise, Article 106 of Egyptian legislation specifies: "No means of naming or displaying a product shall be used in a manner that misleads the public about its geographical origin, even if the actual origin is correct." An illustration of this would be labeling shoes as "Italian" in either English or Italian to mislead consumers into thinking they are produced in Italy, a country renowned for its footwear industry, which is strictly forbidden.

Dr. Ajja Al-Jilali argues that the geographical name chosen as a geographical indication to distinguish a product should meet several conditions [5, 11]:

1. To qualify for geographical indication protection, a region must be recognized for generating products that possess a specific or unique quality. If a product of identical quality and specifications is made in another location, it will not be eligible for such protection. A prime example is Karrak Jameed, which is celebrated for its exceptional quality in Karak. Should this dried yogurt be produced elsewhere with equal or superior quality, it would not meet the criteria for geographical indication.
2. To qualify as exclusive to a specific geographical area, a product must not be manufactured in other regions. A prime example of this is Iranian carpets, crafted solely in Iran, showcasing distinctive traits that differentiate them from carpets made in other locations. The exceptional artistry and the incorporation of pure wool or silk threads, which are non-flammable and possess unique properties, elevate the value of Iranian carpets. On the other hand, while Turkish carpets may appear similar, they frequently utilize synthetic or cotton threads, leading to varied characteristics.

There are instances where a product name linked to a specific geographical region can be used as a trademark without breaching legal regulations. For instance, the word "Cologne" refers to a type of scented alcoholic product that has its roots in Cologne, Germany. Due to its prevalent usage in Arabic-speaking nations, this term has evolved into a generic descriptor for similar items. A manufacturer can label their fragrance as "Cologne" without infringing the law, as outlined in Article 7 of the Jordanian Law, which specifies: "The following shall not be considered a violation of this law: …b. The use of a geographical indication in any manner that indicates another country if it is identical to the commonly accepted term in Arabic for any product or service in the Kingdom" [6, 12]. Likewise, Egyptian law in Article 108 permits the use of geographical names that have become predominantly associated with the commercial designation of a product category instead of its geographical roots.

The Link Between Product Quality and Geographic Area

The Paris Court of Appeal, part of the French judiciary, declined to acknowledge "Moutarde Dijon" as a geographical indication for mustard production due to the fact that its quality is not exclusive to that specific region; similar quality mustard is made in other areas [7, 13]. Similarly, the court did not grant protection to "Camembert" as a geographical indication for a type of French cheese, again because its quality is not confined to that geographical location and can be replicated in other regions [8, 14]. This suggests that a product's quality must be inherently tied to the geographical area of its origin, ensuring it cannot be produced with equivalent quality elsewhere. A pertinent example is Ceylon tea, which remains unmatched in quality, color, taste, and flavor by any other country. The assessment of product quality encompasses various criteria, such as the level of excellence, consumer demand, product uniqueness, the expertise of the producer or manufacturer, the established reputation of the product name [9, 15], its market value, and the extent of its sales both domestically and internationally [10, 16].

3 The Link Between Product Quality and Natural and Human Factors

This indicates that either natural and human elements, or a combination of the two, must impact the quality of the product, thereby linking that quality to its geographical origin and distinguishing it from products from other regions. This influence is a natural outcome, as human factors shape the product's quality based on its production or manufacturing methods, which are defining traits for which producers in a particular geographical area are recognized, such as the technique used to create Karak Jameed. The accumulated experience that the local population has gained over generations from craftsmen or manufacturers, passed down from fathers to grandfathers through long-standing customs marked by tradition, stability, and notable reputation, also plays a significant role. Additionally, natural elements affect the quality of the product through land fertility, favorable weather conditions, and a climate that is well-suited for a specific area, all of which serve as influential and supportive factors in cultivating a unique type of agricultural products that differ from those found in other locations. For instance, the oil from Samh Al-Kafarat is renowned for its unique taste and flavor, attributed to the natural qualities of the Samh region in Irbid. This raises the question: what if we sourced the raw materials and produced the products in a different country? In this scenario, we are only discussing the raw materials, not the final product, particularly if additional elements are introduced that change the product's essence specific to that region. Take, for example, Ceylon tea, which is packaged outside of Sri Lanka without impacting its geographical indication. Conversely, when Syria utilizes Dead Sea clay for cosmetic production, it does so without a geographical indication, clarifying in the commercial statement that the clay is sourced from Dead Sea products rather than claiming a geographical indication. This is not viewed as a violation of any geographical indication, especially since Dead Sea clay is not registered as such, rendering its protection unfeasible. Moreover, these materials may lose the distinctive qualities of the products they are used to create due to the added components, unlike French perfumes, which possess unique characteristics that set them apart from Arab perfumes or others. In his definition of geographical indication, the Jordanian legislator failed to mention the factors influencing the quality of such indications. In contrast, the Omani legislator addressed this issue first, as noted in Article (1) of the Law on the Protection of Geographical Indications, which states: "… and this statement (indication) includes natural and human factors, or both" [11, 12, 17]. Thus, we suggest that the Jordanian legislator consider this aspect when contemplating amendments to the law, as outlined in our recommendations at the conclusion of this modest effort. This consideration is not exclusive to agricultural products, from which it may have originated, but extends to various other sectors. The rationale behind this is the use of the indication to emphasize specific characteristics of the product, which can be attributed to a variety of factors, including [18]:

1. Human elements (skill-related factors) unique to the region where those products are produced.

2. Elements tied to customs and traditions, which depend on artisanal industries and local natural resources entrenched in various cultures, include activities like rug and carpet weaving, lace knitting (crochet), cigar production in Cuba, and the creation of oils such as olive oil, a staple in Sicily.

4 The Legality of Geographical Indications

This condition may be viewed as more of a protective measure than a standard for differentiating geographical indications from other legal classifications. While all other legal classifications necessitate legality for their legal protection, the legality associated with geographical indications varies somewhat, as it pertains to particular instances of legality stemming from the TRIPS Agreement and comparative laws. These cases include:

- First: When geographical indications do not conform to legislative definitions.

For instance, according to Articles 2 and 3 of the Jordanian Geographical Indications Law, an indication is deemed illegal if it does not relate to the geographical area of its origin, if it is not connected to a specific product, or if its quality cannot be solely ascribed to a particular geographical location. This requirement is similarly covered in Article 4 of the Omani legislation [11, 19].

- Second: When geographical indications lead to consumer deception or involve unfair competition.

In these instances, it is prohibited to refer to or showcase the product to the public in a manner that suggests a geographical origin that differs from its actual source, even if the wording is accurate. This stipulation is addressed in comparative legislations if it results in public deception or unfair competition, which contradicts the principles of fair competition in industrial and commercial practices [12, 13, 20, 21].

- Third: When the geographical indication violates public order and morals.

The notion of public order and morals encompasses a wide range of interpretations. What may be deemed a breach of public order and morals in Jordan could be viewed differently in another nation, such as those in the West, or what was once considered a violation in Jordan may no longer hold the same status in the region today. This variability arises from the fact that public order and morals are influenced by customs, traditions, and the passage of time [15, 16, 22, 23]. Nevertheless, it can be asserted that any geographical indication featuring an obscene term that offends public decency and contradicts the ethical, religious, and social values of any community—regardless of whether it fulfills all necessary conditions and standards—cannot be registered as a geographical indication. Looking at Jordanian legislation, this criterion is not stated explicitly; however, it is implied within the general legal principles that legality is essential for the protection of any right. In contrast, the Omani legislator has clearly defined legality in Article 4(b) [2, 11, 16, 24].

In this context, the researchers take issue with those who claim that the lack of a legality criterion in Jordanian law stems from the Jordanian legislator's explicit endorsement of wine and spirits as a geographical indication, provided that the product's quality is linked to its geographic origin (Article 3/2 of the Jordanian Geographical Indications Law). The mention of "wine" in the legislation by the Jordanian legislator aligns with the TRIPS Agreement, which grants enhanced protection for wines and spirits, with the goal of aiding Jordan's accession to the World Trade Organization during that period. According to Article 23 of the TRIPS Agreement, additional protection is afforded to geographical indications concerning wines and spirits, which states [11, 17, 25]:

1. Each Member must ensure that interested parties have the legal tools to stop the use of geographical indications for wines that do not come from the specified location or for spirits that do not originate from the indicated area, regardless of whether the actual origin of the products is stated or if the geographical indication is presented in translation or alongside terms like "kind," "type," "style," "imitation," or similar expressions.
2. The Members shall ensure that the registration of a trademark for wines featuring a geographical indication linked to wines, or for spirits with a geographical indication related to spirits, is refused or invalidated, either automatically if their laws allow or upon request from an interested party, concerning wines or spirits that do not come from the indicated location associated with the geographical indication in question [1, 17, 18].
3. Protection will be granted to each homonymous geographical indication for wines, in accordance with the stipulations of paragraph 4 of Article 22. It is the responsibility of each Member to establish the practical conditions that will allow for the differentiation of the relevant homonymous indications, while considering the necessity of fair treatment for the involved producers and preventing consumer deception [19].
4. To enhance the safeguarding of geographical indications for wines, discussions will be initiated in the TRIPS Council regarding the creation of a multilateral system for the notification and registration of such indications for wines that qualify for protection among participating Members [20].

5 Conclusion

To summarize, the research underscored the significance of geographical indications in safeguarding and improving the quality of products linked to particular geographical areas. By analyzing data and gathering information from various sources, the study illustrated that a robust legal structure for the protection of geographical indications is essential for maintaining quality and uniqueness in the marketplace.

5.1 Findings

The study reached the following conclusions:

- Geographical indications are essential for safeguarding the reputation of products and improving their quality, which in turn boosts their market value. Additionally, they foster equitable competition between local and global producers.
- While the existing legal frameworks offer solid protection for geographical indications, it is essential to revise them to align with the evolving global markets and international standards.
- Distinct distinctions exist between trademarks and geographical indications regarding their legal protections and practical uses. Trademarks prioritize commercial identity, whereas geographical indications highlight the product's geographical and environmental traits.

5.2 Recommendations

- Update GI regulations to keep pace with changes in global markets and improve their alignment with international standards.
- Raise the awareness of producers and consumers about the importance and benefits of geographical indications, contributing to better product protection and improved quality.
- Strengthen international cooperation between countries and legal institutions to exchange knowledge and experience and improve global protection of geographical indications.
- Conduct future research to further assess the impact of GIs on the market and identify new challenges they may face.

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Evaluation of Legislation and Procedures for Foreign Technology Companies: A Comparative Analysis with Emphasis on Digital Transformation



Yasar Alhiniti and Khalif Saleh Dhiab Amoush

Abstract The focus of this study is to examine the distinctions between active and inactive foreign technology companies in terms of legislation and procedures, specifically in relation to the impact of digital transformation. To provide a comprehensive analysis, the study incorporates digital aspects into the comparison of these two types of companies. The findings of the analysis highlight significant differences and similarities between active and inactive foreign technology companies. While both types of companies go through registration and document submission processes, their requirements diverge in various areas. Active companies, for instance, are obligated to obtain licenses, pay legal fees, and submit annual financial statements. On the other hand, inactive companies are exempt from these fees and are only required to submit financial statements for a period of two years. Moreover, inactive companies must ensure that 50% of their workforce consists of local citizens, whereas there is no such requirement for active companies. Inactive companies are also restricted from engaging in commercial or industrial activities, limiting their operations to coordination with their main office. The study also explores the influence of digital tools and platforms on these legislative and procedural requirements. Drawing from these insights, the study offers recommendations to enhance the legislation and procedures pertaining to foreign companies. These recommendations include the integration of digital solutions to improve transparency and efficiency in financial reporting and employment practices.

Keywords Foreign technology companies · Active companies · Inactive companies · Legislation · Legal procedures · Digital transformation · National workforce · Financial statements · Legal fees

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1 Introduction

To prevent any confusion and to ensure that everyone involved understands the legal and operational aspects, it is important to differentiate between companies that resemble active foreign companies in terms of their business activities. This distinction is crucial in fostering trust and providing reassurance to all stakeholders.

To discern the disparities between these companies, one must possess an extensive comprehension of the laws and legal processes that govern their activities. The prerequisites for registration, submission of documents, payment of legal fees, and fulfillment of tax obligations differ among these company classifications. Furthermore, the employment of local individuals directly impacts the presence and longevity of these companies, as inactive companies are obligated to hire a specific percentage of local workers, while active companies are exempt from such restrictions. As a result, this clear differentiation contributes to the improvement of the legal and regulatory work environment, ensuring equitable and sustainable interactions with various types of companies, whether they are domestic or foreign [1].

The objective of this study is to provide clarity on the disparities between national companies and actively operating foreign companies in terms of their nationality. The study is structured into two distinct sections: the initial section aims to differentiate between active foreign companies and national companies, while the subsequent section aims to differentiate between active foreign companies and those that are not currently operational.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Explain the differences between domestic companies and active foreign companies based on nationality.
- Determine the impact of the company's nationality on its business activities, ownership and jurisdictional powers.
- Analyze how a company's nationality is determined under the Jordanian Companies Act No. (22) of 1997.
- Highlight the position of the Jordanian and Egyptian judiciary in determining a company's nationality.

1.2 Study Methodology

To accomplish its goals and examine the fundamental disparities between active and inactive foreign companies in Jordan, the study employed a descriptive-analytical approach. It extensively utilized secondary sources, including academic literature,

books, and relevant Jordanian legislation, to offer a thorough and lucid comprehension of the variations between active and inactive foreign companies in Jordan. Additionally, the study explored the implications of these differences on the investment and economic landscape in Jordan.

2 Distinguishing Between National Companies and Active Foreign Companies

When differentiating between a national company and an active foreign company, the key factor to consider is nationality. This determination holds significant implications, such as the ability to engage in all economic activities, complete ownership, and establishing jurisdictional competence [2].

The legal identity of a company is determined by the Jordanian legislature, as stated in Article (4) of the Jordanian Companies Law No. (22) of 1997. This law establishes that once a company is established and registered in Jordan, it is recognized as a Jordanian entity with its headquarters located within the country. Nationality, on the other hand, refers to the legal and political connection between an individual and a specific state, making them a member of its population.

The Jordanian legislator has clearly chosen objective criteria, rather than personal criteria, to determine a company's nationality. These criteria include the place of establishment or formation and the principal place of management. The Jordanian judiciary has supported this approach, as seen in a decision by the Jordanian Court of Cassation. The court stated that the provisions of the Companies Law, specifically those pertaining to holding companies, only apply to holding companies registered in Jordan. Companies registered outside of Jordan are not subject to these provisions. Another decision by the same court emphasized that legal and financial personality are only established after the formation and registration of a company according to Article 4 of the Companies Law. Therefore, disputes related to financial claims arising from the establishment procedures and transactions of a company should be resolved with the partners who established the company, rather than with the company itself. In yet another decision, the court stated that litigation should be initiated against companies registered and established in Jordan under the Companies Law, with their principal office located in Jordan. These companies are considered legal entities and hold Jordanian nationality according to Article 4 of the Companies Law [3, 4].

The stance taken by the legislator regarding the adoption of the principal place of management as the determining factor has received backing from the Jordanian judiciary. A ruling from the Jordanian Court of Cassation affirms this position, stating that the applicable legal system for legal entities is determined by the jurisdiction where their actual principal place of management is located. If these entities carry out their primary operations within Jordan, then Jordanian law applies, in accordance with Article (12/2) of the Jordanian Civil Code [5, 6].

The Jordanian legislator has effectively merged two factors in determining a company's nationality: one as the cause and the other as a direct consequence. These criteria are inseparable, ensuring that companies in Jordan cannot obtain nationality without actively contributing to the economy [7].

The determination of a company's nationality in Egypt has been entrusted to the judiciary, with the exception of regulations pertaining to joint-stock companies. Due to the lack of comprehensive legislation on all aspects of company nationality by the Egyptian legislator, the courts have resorted to combining multiple criteria [8]. This can be seen in a ruling made by the Egyptian judiciary on January 31, 1946, which stated that if a partnership company is established in Egypt in accordance with the requirements of the Egyptian Commercial Law and has its main place of management in Egypt, it should unquestionably be considered as having Egyptian nationality. Furthermore, any disputes between the company and Egyptian entities would fall under the jurisdiction of the national courts [9].

The combination of both criteria by the Jordanian legislator is viewed favorably by the researcher. This decision establishes a meaningful bond and association between the company and the state, guaranteeing that foreign companies operating in the host country do not receive special treatment or exemptions without making a positive contribution to the national economy and addressing unemployment. Furthermore, the integration of these criteria effectively resolves the problem of foreign companies holding multiple nationalities.

3 Distinguishing Between Active and Inactive Foreign Companies

Chapter Twelve of the Jordanian Companies Law No. (22) of 1997 focuses on foreign companies, whether they are currently operating or not. This particular law devotes two sections to address this matter. The first section, consisting of Articles (240–244), specifically delves into the regulations concerning active foreign companies. On the other hand, the second section, encompassing Articles (245–251), deals with the provisions regarding inactive foreign companies.

Upon careful examination of the regulations pertaining to both categories of foreign companies, it becomes apparent that there are certain similarities between them. However, it is important to note that despite these similarities, there exist notable distinctions. Both types of foreign companies are afforded foreign nationality, as determined by the criteria established by the Jordanian legislator to differentiate between national and foreign companies, as discussed in the preceding section. Furthermore, the legislator has conferred legal personality upon both types, necessitating their registration in the foreign companies' register in accordance with Articles (241, 242, 245, 246) of the Jordanian Companies Law No. (22) of 1997. Additionally, both types are required to furnish the requisite documentation to the General

Supervisor of Companies in order to fulfill the registration process as mandated by the law prior to commencing operations [10, 11].

The Companies Regulatory Official has been given the power by the legislator to approve or decline the registration of foreign companies, whether they are currently active or inactive, and this authority is exercised at their discretion. In the event of rejection, the Companies Regulatory Official is not obligated to provide a justification for their decision. However, if the registration is approved, the necessary procedures are carried out and officially announced in the gazette. When it comes to making any modifications or alterations to the company, both types of companies are required by the legislator to follow the same procedures, and they must inform the supervisor within thirty days of any such changes taking place [12].

Despite the similarities in some procedures between the two types, there are many significant differences between them, which will be addressed as follows:

Requirement for a Work Authorization

In accordance with Article (240/b) of the Companies Law, active foreign companies are obligated by legislation to acquire a work authorization from the appropriate authority. This requirement specifically applies to foreign entities engaging in commercial activities within Jordan. The law states that no company or foreign entity can conduct business unless it is registered under the provisions of this law and has obtained a work permit in adherence to the applicable laws and regulations. Therefore, it is clear that any foreign company desiring to operate in Jordan must secure an authorization from the relevant authority, considering the nature of its business, as previously mentioned.

Obligation to Pay Legal Fees

According to Article (242/a) of the Jordanian Companies Law No. (22) of 1997, active foreign companies have a specific obligation to pay legal fees. However, the exact amount of these fees and the recipient are not specified by the legislator. The legislator's role is simply to require the payment of legal fees. To determine the specific fees, we must refer to the Jordanian Companies System No. (50) of 1997. According to Article (4) of this system, the Ministry of Industry and Trade is responsible for collecting fees for the registration of companies. The fees for registering an active foreign company in Jordan are as follows: $1410 if the company's registered capital is $1,410,853.00 or less, and $2821 if the capital exceeds $1,410,853.00. Additionally, a fee of $3 is charged for issuing a registration certificate. In contrast, the lawmaker has made provisions to waive the legal fees associated with registration and publication for inactive foreign companies, as stated in Article (248/a + c) of the Jordanian Companies Law No. (22) of 1997. Furthermore, these companies are not required to register with industrial, commercial chambers, or professional syndicates, nor are they obligated to pay any associated fees, including those for business license issuance. Additionally, they are exempt from income and social services taxes, in accordance with Article (248/b) of the same law and Article (4/a/3) of the Income Tax Law No. (34) of 2014. Moreover, these companies enjoy exemption from customs

fees, import duties, and other charges, as outlined in Article (248/e) of the Jordanian Companies Law No. (22) of 1997. They are also not required to pay customs fees on furniture and equipment imported for office furnishing, as stated in Article (248/w) of the same law [13]. These exemptions are granted on the condition that the company does not engage in any industrial, commercial, or professional activities within Jordan.

Obligation to Submit Financial Statements

According to Article (246/a/4) of the Jordanian Companies Law No. (22) of 1997 [5, 14], foreign companies that are not currently operating are obligated to provide financial statements for the past two consecutive years, certified by a legal auditor, from their headquarters. However, the minister has the authority to exempt these companies from submitting the statements if a justified recommendation is provided by the supervisor. Conversely, active foreign companies are only required to submit financial statements for the previous year, certified by a legal auditor, as stated in Article (241/a/5) of the same law [15].

In an effort to safeguard the legal and financial standing of inactive foreign companies and establish trust among their stakeholders, the legislator has mandated the submission of certified financial statements for the previous two years. This requirement serves to inform potential partners and investors about the company's financial health before engaging in any business relationships. Furthermore, it enables the state to assess the company's impact on the economy and make informed decisions regarding its presence within its borders. However, the minister retains the authority to exempt a company from this obligation based on justifiable grounds, as recommended by their supervisor.

In contrast, the lawmaker displayed greater flexibility towards foreign companies that were actively operating, simply mandating the submission of their previous year's financial statements, without empowering the minister to exempt them from this requirement [16].

Nature of the Operations of Active and Inactive Foreign Companies

According to Article (240/a) of the Jordanian Companies Law No. (22) of 1997, the legislator has categorized the activities of active foreign companies into two distinct types. The first type encompasses foreign companies that primarily operate without establishing branches. These companies are granted tenders, which they carry out within the borders. Upon the completion of the tender, the company is dissolved unless it secures new contracts during the execution of the initial tender. In such instances, the company is obligated to fulfill the newly awarded assignments, and only after meeting all responsibilities will its registration be revoked and its name removed from the Companies Regulatory Official.

The second category comprises of international corporations that establish a permanent presence and primarily operate through branches after obtaining the necessary licenses from the appropriate regulatory body. These companies also have the option to conduct business without establishing branches. If a company intends to engage in business activities in a different country, it can establish a branch there to

carry out operations on behalf of the company. However, there is a debate regarding the autonomy of the branch, with some arguing that it functions as an independent entity separate from the headquarters, possessing broad authority to represent the company in interactions with external parties and in legal disputes. In this regard, the branch can be sued by external parties without involving the head office, and conversely, it can initiate legal action against others [17].

The sectors in which foreign companies are permitted to operate in Egypt have been delineated by the Egyptian legislator, as outlined in Article 1 of the Investment Incentives and Guarantees Law No. (72) of 2017 [18]. These sectors encompass infrastructure, manufacturing and mining, software transfer and computer systems, developmental production, medical services, specific financial services, agriculture and reclamation of desert lands, hotels, and tourism.

According to Egyptian law, capital companies, such as limited liability companies, partnership limited by shares, and joint-stock companies, are allowed to establish projects in Egypt for a lasting presence. On the other hand, if these companies only intend to operate for a specific duration, they have the option to establish a branch or representative office in Egypt [19].

Under the Jordanian Companies Law No. (22) of 1997, inactive foreign companies face strict regulations. Article (245/b) states that these companies will be removed from the register if they engage in any form of activity. It is crucial for them to refrain from any commercial endeavors, regardless of their scale, as this would be considered a grave violation of the law and could lead to the cancellation of their registration. Furthermore, these companies are obligated to provide compensation to any individuals or entities that may have suffered harm as a result of their actions. Additionally, they are prohibited from acting as commercial agents or intermediaries [20].

In light of the aforementioned information, the lawmaker has made a prudent decision to implement regulations and oversight measures on foreign companies that are inactive. This is done in order to safeguard domestic companies and active foreign companies, which do not receive the same benefits and exemptions as these inactive companies. Consequently, the operations of these companies are restricted to activities such as managing and organizing their operations in alignment with the parent company, conducting market research, relaying information to the parent company, acting as a representative for the parent company in the host country, and providing guidance to the parent company regarding investment opportunities or establishing an active foreign company in the host country [21].

In a similar vein, the Egyptian legislature has implemented measures to prohibit inactive foreign companies from participating in any form of business activity, as outlined in the Egyptian Companies Law and its accompanying regulations. According to Article (173) of the Egyptian Companies Law No. (159) of 1981, inactive companies are explicitly forbidden from engaging in any activities beyond those related to market research and production potential, provided they possess the necessary licenses. Should these companies deviate from their intended purpose and engage in unauthorized activities, they will be subject to removal from the register, pending approval from the designated authority specified in Article (18) of this law

[22]. These texts clearly demonstrate that the Egyptian legislature, much like their Jordanian counterparts, imposes restrictions on inactive foreign companies, limiting their involvement solely to market research, and enforcing penalties, such as removal from the register, for non-compliance [23].

Regarding the Use of National Labor in Foreign Companies

According to Article (249) of the Jordanian Companies Law No. (22) of 1997, it is required that an inactive foreign company operating in Jordan must have a minimum of half of its total employees as Jordanian nationals.

The legislator mandates that foreign companies that are not active must hire local workers, with the condition that the number of Jordanian employees is at least half of the total workforce. To ensure compliance, these companies are required to submit lists to the Companies Regulatory Official that include the names and nationalities of their employees. Moreover, they must provide certified copies of employment contracts for their Jordanian employees, which will be scrutinized by the Ministry of Labor to verify adherence to the legally required ratio. This verification process involves confirming the accuracy of the names in the contracts and ensuring that the contracts align with the relevant legal provisions [24].

Initially, the decision made by the Jordanian legislator to mandate that inactive foreign companies hire at least 50% national labor was seen as commendable by the researcher. However, it is suggested that this percentage be reevaluated and raised to "75%" of the total workforce. By doing so, not only would this help combat unemployment rates, but it would also be consistent with the exemptions and privileges granted to these companies.

The presence of foreign workers in Jordanian companies is mandated by Article (249) of the Jordanian Companies Law No. (22) of 1997. Consequently, these companies are obligated to comply with the regulations pertaining to the employment of foreign labor outlined in Article (12) of the Jordanian Labor Law No. (8) of 1996. This article establishes two criteria for the employment of foreign labor: Firstly, the job must require skills and expertise that are not readily available among the local workforce, and secondly, there must be a shortage of domestic labor. The utilization of foreign labor necessitates approval from the Minister of Labor or their representative, and the work permit for foreign employees should not exceed one year, with the possibility of renewal [25].

The Jordanian Companies Law No. (22) of 1997 does not include any specific provision regarding the required percentage of national or foreign labor in active foreign companies. To fill this legislative gap, it is necessary to examine other regulations that may address this issue and establish a national labor ratio for these companies. Starting at the highest level of legislation, the Jordanian Constitution affirms the right of Jordanians to work and imposes an obligation on the state to provide employment opportunities. Article (23/1) of the Jordanian Constitution of 1952 states, "Work is a right for all citizens, and the state must provide it for Jordanians by directing and advancing the national economy." This constitutional text highlights that the state is responsible for ensuring employment opportunities for Jordanians and does not specifically address the right of foreign labor to work in

Jordan. It is evident that the right of Jordanian workers to work is derived from the constitution.

Furthermore, in accordance with Article (12) of the Jordanian Labor Law No. (8) of 1996, there are limitations placed on the employment of foreign workers by both local and international companies. These restrictions encompass certain criteria, such as a scarcity of specialized knowledge and competencies, as well as an inadequate availability of domestic labor to meet the demands of the job market. Approval from the Minister of Labor or their representative, along with a one-year work authorization that can be extended, are prerequisites for hiring foreign labor [26].

The Central Bank of Jordan is granted the power to authorize both local and foreign banks operating in the country to hire foreign workers, with specific guidelines on the number and proportion of non-Jordanian employees in relation to the total bank workforce, as outlined in Article (28) of the Banking Law No. (28) of 2000. This article states that, in accordance with labor regulations, any employment of non-Jordanian staff by a bank requires approval from the Central Bank, which also has the authority to determine the quantity or percentage of non-Jordanian employees relative to the total bank workforce. This grant of authority is based on the recognition of the banking sector's significant impact on the national economy and its consequent importance and sensitivity [27].

In accordance with Insurance Law No. (33) of 1999, it is mandated that all employees working for insurance companies, whether they are of national or foreign origin, must be Jordanian citizens. However, in cases where there is a shortage of necessary expertise and qualifications, non-Jordanians may be employed with the approval of the minister. This requirement is clearly stated in Article (30) of the law, which states that "the company must ensure that all its employees are Jordanian; however, non-Jordanians may be employed if they possess expertise and qualifications that are not readily available. The final decision regarding the employment of non-Jordanians rests with the Minister of Labor, based on the recommendation of the General Manager" [28].

It should be emphasized that the Investment Environment Law No. (21) of 2022 offers opportunities for tax exemptions or reductions in both income and customs taxes as a reward for hiring local workers. Additionally, this law stipulates that foreign labor in these companies should be limited to specialized administrative and technical roles, with a maximum limit of "40%" of the overall workforce in optimal conditions [29].

The intention of the legislator, as evident in this law, was to actively promote the hiring of Jordanian workers and offer incentives and exemptions as a means of reducing unemployment and bolstering the national economy. According to Article (43) of the 1972 Jordanian Lawyers Association Law, foreign companies were obligated to appoint a legal representative or consultant from a pool of registered lawyers. This requirement extended to the foreign company itself, as well as its various branches, agencies, and regional or representative offices.

The researcher observes that while the legislator did not explicitly state a specific percentage for the employment of national labor in active foreign companies, it can be deduced from an analysis of other legislative documents that this was a

matter of great importance to him. The legislator placed restrictions on the hiring of foreign workers and prioritized the employment of national labor, with only limited exceptions granted for the hiring of foreign workers with official approval. This was done to safeguard the expertise of the local workforce and prevent their migration to other countries by avoiding competition or dominance by foreign labor. Additionally, it aimed to protect the national economy by ensuring that active foreign companies exclusively hire foreign workers, thereby addressing the issue of unemployment among Jordanian workers, which has significant economic, social, and political implications for the country [30].

The disparity between the Egyptian and Jordanian legislator's positions on the requirement of national labor in foreign companies is quite evident. In Egypt, specific percentages have been established for both Egyptian and foreign employees in these companies, with a distinction made between two categories of workers. The first category encompasses non-technical and administrative Egyptian workers in foreign companies. According to Article 174 of the Egyptian Companies Law, it is mandated that the number of Egyptian employees should constitute no less than 90% of the total workforce, and their wages should not be lower than 80% of the total wages paid by the company.

As stated in Article (175) of the Egyptian Companies Law, the second category encompasses Egyptian workers employed in technical and administrative roles within foreign companies. It is mandated that these workers make up at least 75% of the overall workforce and receive wages amounting to no less than 70% of the total wages paid by the company. This requirement ensures that joint-stock companies operating in Egypt prioritize the employment and compensation of Egyptian workers in these crucial positions [31].

In certain cases, the minister has the authority to authorize the hiring of foreign workers, technicians, or consultants if there is a lack of available Egyptians for these roles. It should be noted that these foreign workers are not included in the specified percentages outlined in Article (176) of the aforementioned law. This article states that "the minister with jurisdiction may grant permission for the employment of foreign workers, consultants, or specialists if there are no Egyptians available" [2].

According to the executive regulation of the Egyptian Companies Law No. (159) of 1981, foreign company branches were obligated to submit a report to the Companies Authority within three months after the conclusion of the fiscal year. This report should include information on the number of employees, their respective positions, salaries, and nationalities. Furthermore, it was necessary for these branches to calculate the wages of their Egyptian employees. In addition to this, offices and agencies of foreign companies were also required to submit an annual report to the Companies Authority. This report should contain details such as the names and nationalities of employees, their positions, total wages, as well as the percentage of wages allocated to Egyptian employees [16, 32].

Article (41) of the Egyptian Companies Law No. (159) of 1981 grants employees working for foreign company branches and similar entities the right to receive a portion of the yearly profits. This provision stipulates that the general assembly, in accordance with the board of directors' recommendation, shall determine the specific

share, which should not be less than 10% of the profits or exceed the total annual wages of the employees [18, 30].

In comparing the Egyptian and Jordanian legislators, the researcher concludes that the Egyptian legislator demonstrated greater clarity and diligence when it came to defining the proportion of domestic workers in foreign companies. The Egyptian legislator placed a higher emphasis on employing national workers over foreign workers and imposed limitations on the hiring of foreigners in these companies, except in cases where there was a lack of available Egyptian labor. This approach aimed to bolster the national economy and tackle the problem of unemployment [16].

It is recommended by the researcher that the legislator in Jordan take a closer look at the provisions outlined in the Companies Law No. (22) of 1997, specifically those pertaining to foreign companies that are actively operating within the country. One suggestion is to establish a higher percentage requirement for Jordanian labor within these companies. This measure would serve to safeguard the national economy against foreign companies that may dominate the labor market by hiring foreign workers instead of local labor. Additionally, it would address the issue of unemployment among Jordanian workers and prevent the migration of qualified individuals seeking job opportunities abroad that align with their skills and qualifications [27].

4 Conclusion

While foreign companies, whether operating or non-operating, share similarities in terms of foreign nationality, legal personality, and registration requirements, there are notable distinctions when it comes to the necessity of a work authorization, payment of legal fees, submission of financial statements, nature of operations, and utilization of national labor. These disparities serve the purpose of safeguarding the domestic economy and maintaining equilibrium between foreign and national enterprises.

4.1 Results

The study concluded the following results:

1. Both operating and non-operating foreign companies must go through a registration process and provide the required documentation. However, there are notable distinctions between the two types: operating companies must obtain an authorization, fulfill legal obligations, and submit financial statements for a period of one year, whereas non-operating companies are exempt from legal and tax fees and are only required to submit financial statements for a duration of two years.
2. Operating companies do not have a specific requirement for the percentage of national labor they must employ, whereas non-operating companies are mandated to have at least half of their workforce comprised of Jordanians.

3. Non-operating companies encounter limitations that prohibit their involvement in any commercial or industrial endeavors, restricting them solely to coordinating with their main office.
4. The determination of a company's nationality in Jordanian legislation is based on objective criteria, including the place of incorporation or formation and the principal place of management.
5. The Jordanian courts uphold the standards established by Jordanian legislation, ensuring that the Jordanian Companies Law is exclusively applied to companies that are registered within Jordan's jurisdiction.
6. By employing both the criteria of place of incorporation and principal place of management, companies operating within Jordan play a crucial role in bolstering the national economy.
7. In Egypt, the determination of a company's nationality is entrusted to the judiciary, with the exception of joint-stock companies, leading to the existence of multiple and overlapping criteria.

4.2 Recommendations

1. Highlight the importance of adopting specific objective criteria for determining the nationality of an enterprise in order to strengthen the national economy.
2. Encourage policymakers in other countries to follow the Jordanian approach of combining the place of incorporation and principal place of management criteria.
3. Strengthen supervision of operating foreign companies to ensure their positive impact on the domestic economy and contribute to reducing unemployment.
4. Support legislation that promotes transparency and clarity in determining a company's nationality to avoid multiple and overlapping nationalities.
5. Encourage foreign investment while ensuring the protection of domestic workers' rights.
6. Strengthen restrictions on non-trading companies to prevent any illegal activities.
7. Encourage further legal studies on the impact of a company's nationality on the economy and jurisdiction to ensure sustainable legal solutions.

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BEDVS—Biometric Enabled Digital Voting System

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Abstract Our country, India is the largest democratic country in the world. So it is essential to make sure that the governing body is elected through a fair election. As of now, Voters have to go to the polling booth to vote which takes time and the voting percentage is also low due to some voters do not go to polling booth to cast the vote. This process requires large man force and it also require more time to declare the result and to overcome this disadvantage we need to change the system. So here comes the Digital Voting, it allow voters to vote online via computers, laptop and smartphones from anywhere. Digital Voting has Admin panel which is handled by election commission and voter login which will be handled by voters. Voters need to register themselves using VoterId to login the voter panel for voting. The system allows voters to view all the details of candidates in there area and once the election is started voters can vote the candidates. This system uses 2factor authentication OTP and Face Recognition. When voters register themselves they have to complete the verification via OTP and also upload the video for the face id and at the time of voting they need to verify themselves by OTP and face recognition system.

Keywords Online voting · Authentication · Security system · 2factor · OTP · Scientific and technological progress

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1 Introduction

Automated systems are considered a key component in the Fourth Industrial Revolution that helps improve the effectiveness of digital voting systems with biometric capabilities [1]. The main objective of democracy is "vote" by which the people can elect the candidates for forming an efficient government such that their standard living can be improved. In developing countries like "INDIA", the election commission follows manual voting mechanism which is done by the electronic voting machine (EVM). EVMs are electronic voting machines that enable the voter with a button for each choice of candidate. An EVM is designed with two units: the control unit and the balloting unit. These units are joined together by a cable. The control unit of the EVM is kept with the presiding officer or the polling officer. The balloting unit is kept within the voting compartment for electors to cast their votes. This is done to ensure that the polling officer verifies your identity. With the EVM, instead of issuing a ballot paper, the polling officer will press the Ballot Button which enables the voter to cast their vote. A list of candidates names and/or symbols will be available on the machine with a blue button next to it. The voter can press the button next to the candidate's name they wish to vote for. This process require large man force and it is expensive. So, to overcome these problem we proposed the Digital Voting system. By using Digital Voting System anyone can vote the candidate from anywhere through their Smartphones or Computers and for the security and to avoid forgery we used 2factor verification system which is OTP and Face recognition by which no one can misuse thus system and One Voter can vote only once.

2 Motivation

In India, voting is very important for choosing our leaders and making our country better. Till now we use machines called Electronic Voting Machines (EVMs) to vote but not every citizen of our country are voting. So we decided a better way to make voting easier and safer. We decided to make a model that is digital voting, we can vote using our phones or computers. This saves time and makes it easier for everyone to vote. To make sure only the right people vote, we used face recognition. When we register to vote, we take a picture of our face. Then the system checks if our face matches the one we registered with. If it matches the person can vote only per election. This keeps things fair for everyone. The current voting machines have some problems. Sometimes people alter with the machine's program to change the votes. And also some people vote illegally in more than one place. But with digital voting we can fix these problems and make voting better for everyone in India. Digital voting not only makes voting more accessible but also ensures the integrity of the electoral process. Further using advanced security measures like biometric authentication, we can prevent fraud and manipulation of the votes safeguarding the democratic principles upon which our nation is built. Digital voting also enables

realtime monitoring and auditing, enhancing transparency and accountability. Digital voting offers cost-effective and environmentally friendly solutions as compared to EVM and paper-based methods. It will reduce the need for physical infrastructure, human force for security purpose and paper ballots.

We can conclude by digital voting represents a significant step forward in modernizing our electoral system and strengthening democracy in India. By using new ideas and making the most of technology, we can make sure that everyone's opinions are listened to and every vote matters in determining the future of our country.

3 Literature Review

Shrivastava et al. [2] develop an online voting system where voters can cast their ballots remotely without visiting polling booths. They employ username and password authentication instead of utilizing biometric authentication. In our project, we utilize biometric authentication, which can enhance the security of the system.

Abdulhamid et al. [3] construct an E-voting system to enhance the efficiency of the voting process. They utilize username and password for user authentication and also provide session validation and session timeout to prevent session hijacking. In our project, we employ Face Recognition Technology to secure the system from unauthorized users.

Hazzaa proposed a "Web Based Voting System Using Fingerprint Design and Implementation" [4] to enhance the security of the voting system and make it more robust. The proposed EVS enables votersto verify their fingerprint against the stored template in the database.

Nautiyal [5] proposes a system based on face recognition, which suggests a better approach for identification used in criminal identification. They utilize an Image partitioning algorithm. In this work, a pre-captured image is taken in future win 10 to capture a real image and perform real-time image processing.

Patel and Patel [6] paper introduces the face recognition technique based on Partial Hausdorff distance. They employ Hausdorff distance. Further improvements can be made to reduce the computation time. This can be achieved by preprocessing the database images and using clustering techniques.

Yamini et al. [7] develop a class attendance system in Python language using OPENCV, Haar's Cascade, and Viola-Jones framework. In universities and corporate offices, RFID scanners and biometric fingerprint systems are used for attendance marking, leading to security and ethical concerns. Therefore, they develop a system using face detection and recognition techniques. They utilize the Viola-Jones algorithm for face detection and Histogram of Oriented Gradients and Local Binary Patterns for face recognition. OpenCV library is used as the image processing framework. This system is more secure and less time-consuming compared to RFID scanners authentication system for voting purposes. They utilize FM220 Startek Scanner to scan fingerprints and store data. A regular camera captures the voter's image, and PCA (Principal Component Analysis) is employed for feature extraction

and iris detection. When all recorded data successfully match with Aadhar card data stored in the database, the voter is allowed to use the system.

Soomro and Ali [8] develop an authentication application using face recognition technology. They utilize NI MyRIO and LabVIEW, integrating software and hardware devices with OpenCV and NI VISION toolkit to recognize faces in minimal time. MyRIO devices process large real-time data with implemented algorithms and programmed through LabVIEW. LabVIEW is also used to develop the database. This system is employed for authentication to enhance the security of the electronic voting system.

Kavitha [9] developed a fully biometric authentication system for voting purposes. They utilize FM220 Startek Scanner to scan fingerprints and store data. A regular camera captures the voter's image, and PCA (Principal Component Analysis) is employed for feature extraction and iris detection. When all recorded data successfully match with Aadhar card data stored in the database, the voter is allowed to use the system.

Layer biometric authentication technique enhances the security of the system, making it more secure, but it also increases its complexity. Face recognition by a computer is programmed using Python via OpenCV, and this paper discusses the implementation of Eigenfaces and Fisher faces customized in Python. Geometric features and landmark mapping are utilized to construct the feature vector. Algorithms employed for local feature extraction include Gabor Wavelets, Discrete Cosine Transform, and Local Binary Patterns [10].

The current voting process has numerous flaws, and the objective of this project is to minimize the potential for manipulation. This project focuses on implementing fingerprint and facial recognition for vote verification. Various technologies and tools such as Python Development Environment, Linux Interfacing Engine, and Visual Basic are utilized. This dual authentication system reduces the likelihood of fraud and illegal activities, thereby enhancing the security and efficiency of the voting process [11].

4 Existing System

An Electronic Voting Machine (EVM) is a device used for conducting electronic voting in elections. It is a specialized electronic device designed to record votes accurately and securely. EVMs are used to replace traditional paper ballot systems in many countries around the world. An EVM typically consists of a control unit and a balloting unit. The control unit is operated by an election official and manages the voting process, while the balloting unit is used by the voters to cast their votes. The control unit and the balloting unit are connected by a cable.

Advantages

- Accuracy: EVMs are designed to record votes accurately. They eliminate errors caused by manual counting and interpretation of paper ballots, reducing the chances of mistakes in the vote tallying process.
- Reduced invalid votes: EVMs can help reduce the number of invalid votes. They have inbuilt features that guide voters and prevent them from casting multiple or invalid votes, such as overvoting or under voting.
- Transparency: EVMs provide transparency in the voting process. They typically have a display screen that shows the selected candidate or party before the vote is cast, allowing voters to verify their choice. This enhances the confidence of voters in the accuracy of their votes.
- Environmental Impact: EVMs have a positive environmental impact compared to paper ballots. They reduce the consumption of paper and ink, leading to a decrease in deforestation and waste production associated with the printing of millions of ballot papers.

Limitations

- Limited auditability: EVMs often lack comprehensive mechanisms for independent auditing and verification of election results. This can hamper the ability to conduct thorough post-election analysis and investigations in case of disputes or allegations of fraud.
- Cost and maintenance: While EVMs can potentially save costs in the long run, their initial acquisition and maintenance expenses can be significant. This may pose financial challenges for countries with limited resources or frequent elections.
- Lack of voter confidence: Some individuals may have reservations or lack trust in the accuracy and security of EVMs. The absence of tangible data or physical evidence of the vote can contribute to concerns about transparency and the ability to verify election results independently.

Proposed System

Our new voting system is designed to make voting easier and safer for everyone. Instead of going to a polling station, you can now vote online from your computer or phone. This saves time and makes it more convenient for people to participate in elections. To ensure that only the right people vote, we use a special technology called Facial Recognition. When you register to vote, you take a picture of your face, and this picture is used to confirm your identity when you vote. This helps prevent any cheating or fraud. Our system is also easy to use, so even people who aren't very good with technology can vote without any problems. And because it's online, you can vote from anywhere, whether you're at home or on the go. By using modern technology, we're making voting more accessible and secure for everyone. This way, more people can have their voices heard in elections, making our democracy stronger.

Functional Description

Functional description of various software and hardware components is given below:

A. OpenCV: It is short for open-source Computer Vision Library. It aids in image processing and is crucial for various operations related to images, playing a significant role in real-time applications essential for modern systems. With OpenCV, one can process images and videos to detect objects, faces, or even human handwriting.
B. HTML: Hypertext Markup Language, enables the creation of electronic pages or documents displayed on the World Wide Web. It serves as a standard markup language for web pages, with HTML elements represented by <> tags. In this project, we have designed several templates using HTML.
C. CSS: Cascading Style Sheets, is a language that describes the presentation of an HTML document. It controls the layout of different web pages and can manage the layout of multiple pages simultaneously. CSS comments begin with /* and end with */.
D. JavaScript: It is a client-side scripting language of HTML and the web. It is an independent language developed by Netscape and is used to make web pages dynamic and add enhancements such as rollover effects. In HTML, JavaScript code is inserted between tags.
E. PostgreSQL: PostgreSQL, otherwise called Postgres, is a free and opensource social database the board framework underlining extensibility and SQL consistence. We used PostgreSQL maintain all the data. It can easily store and share the data when the system needs it.
F. Django: Django is a high-level Python web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It's free and open source.
G. Web camera: A webcam is a camcorder that captures an image or video in real-time to a computer system, such as the Internet. Webcams are typically small cameras positioned on a desk, attached to a user's monitor, or integrated into the hardware. The image of a voter can be captured using only the front camera of our computer.

5 Face Recognition Working Mechanism

A. Face Recognition: Face or facial recognition is a technique used to identify a human face through technology. This technology aids in recognizing or verifying an individual from a digital image or a video frame from a video source. A facial recognition system utilizes biometrics to map features from a photo or video and compares the information with a database of known faces to find a match. This system employs computer algorithms to identify specific, distinctive details about a person's face.
B. Face detection techniques: Detecting faces is a challenging task due to variations in scale, position, orientation, pose, expression, occlusion, and lighting conditions, which alter the overall appearance of faces. Various approaches for

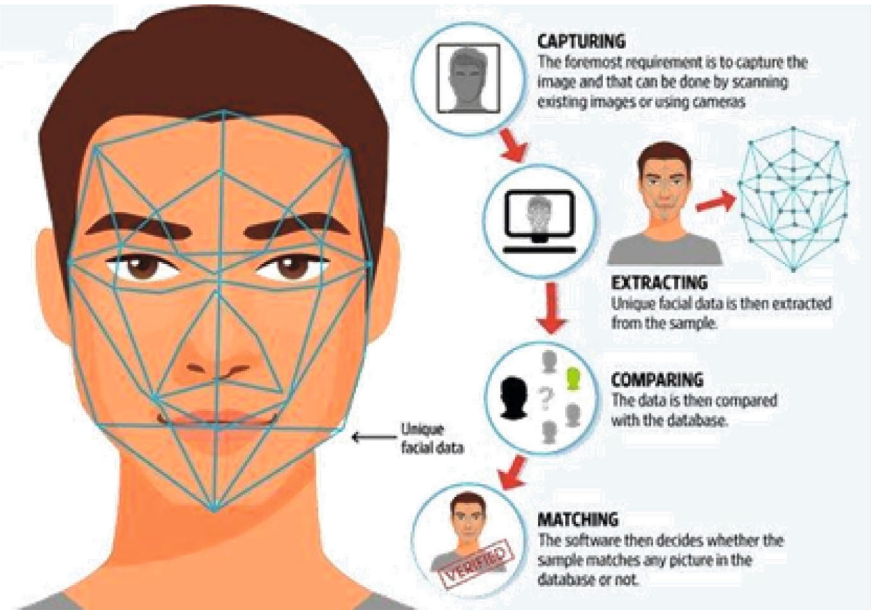


Fig. 1 Face recognition using python

face detection have been proposed, including data-based and appearance-based methods, and techniques such as template matching, skin color, motion, etc., to mention a few. The face detection process is a crucial step as it identifies and locates human faces in images and videos. • The face acknowledgment process is a fundamental development as it perceives and discovers human faces in pictures and chronicles. • The face get process changes simple data (face) into advanced data (information) in light of person's facial features. • The face coordinate methodology checks if the two faces are of same person.

C. Face Recognition using Python: This is illustrated in Fig. 1. It is the fastest-growing programming language globally. It is an object-oriented programming language utilized for software and application development, as well as in data analysis, web applications, mobile applications, etc. In our project, we utilized the OpenCV library in Python for recognizing and detecting the voter's face

6 Working Mechanism

We add several modules in this system like Admin, registration, login, adding candidate, voters, and result.

All modules are interconnected with each other (see Figs. 2, 3, 4, 5, 6, 7, 8, 9 and 10).



Fig. 2 Login page

Application

- The primary objective of this system is to enhance the safety and security of any system by preventing fraudulent activities.
- This system can be employed for attendance tracking in educational institutions, corporate offices, and other establishments.
- Implementation of this system in shopping malls or stores can facilitate secure payment transactions.
- Utilizing this system for criminal identification provides law enforcement with a valuable tool for tracking criminals nationwide.
- Deployment of this system in large server rooms, such as airports or railway stations, enables immediate action when necessary.

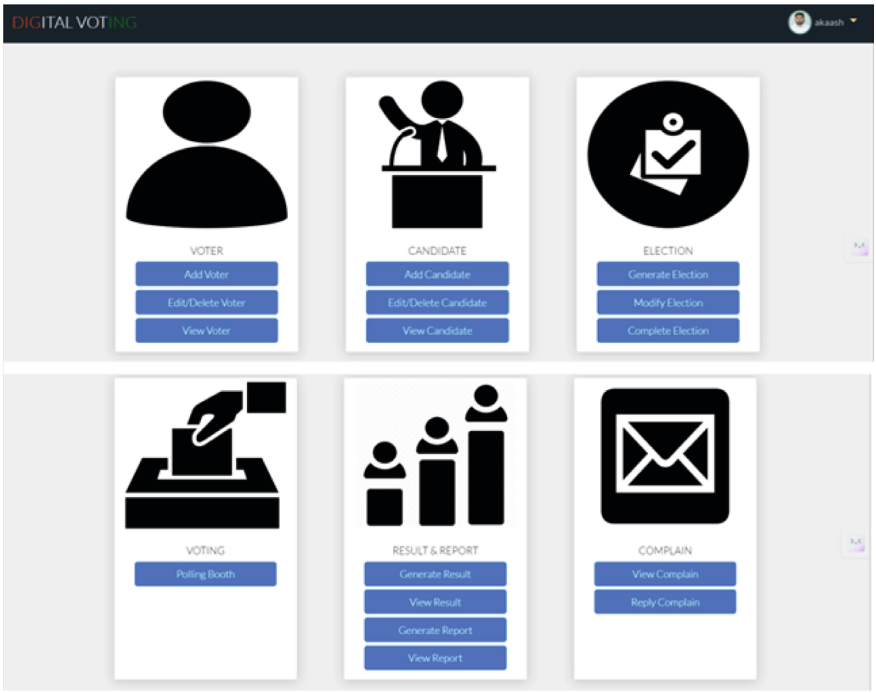


Fig. 3 Admin page

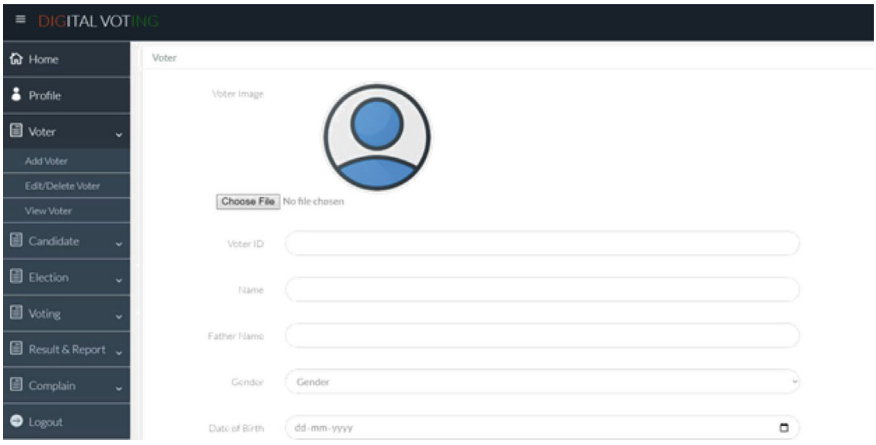


Fig. 4 Add voter

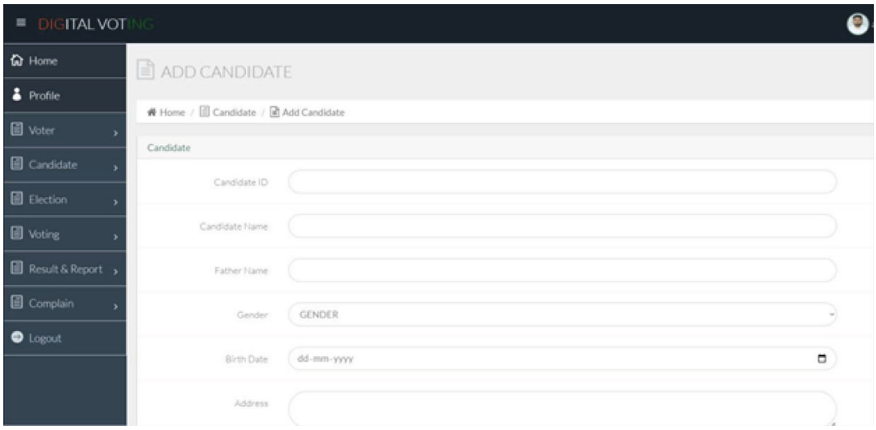


Fig. 5 Add candidate

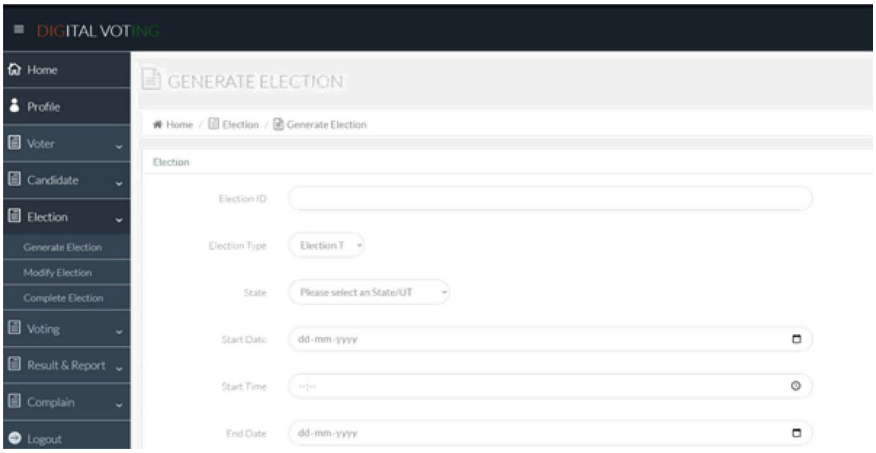


Fig. 6 Generate election

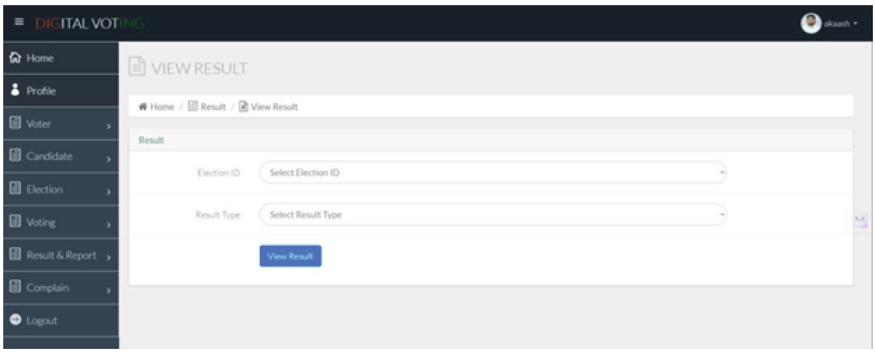


Fig. 7 View result



Fig. 8 Home page

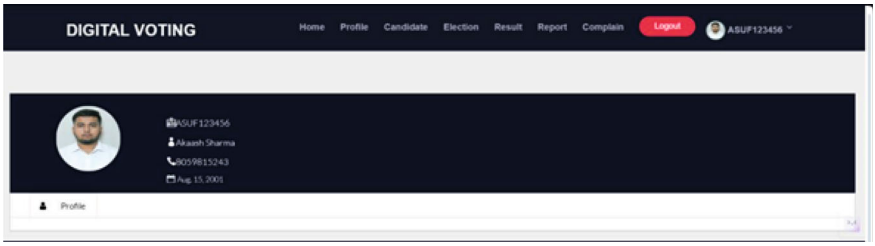


Fig. 9 Voter profile page

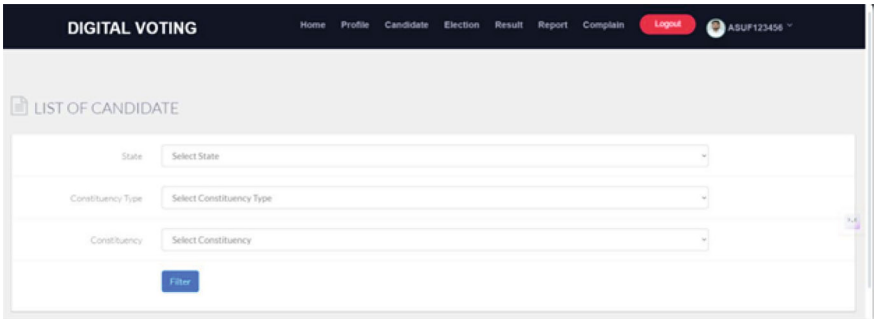


Fig. 10 List of candidates

7 Conclusion

In Conclusion, the Facial Recognition is an Enhanced Online Voting Platform which offers a simple and secure way for people to participate in elections. By allowing voters to cast their ballots from the comfort of their homes using their computers or smartphones, our platform removes the barriers of time and distance associated with traditional voting methods. The use of facial recognition technology adds an extra layer of security to the voting process, it ensures that only eligible voters can participate. When individuals register to vote, they provide a picture of their face, which is used to verify their identity when they go to vote. This helps prevent fraud and ensures the integrity of the electoral system. The user-friendly interface of the platform makes it accessible to people of all ages and backgrounds, it basically promotes participation in the democratic process. It streamlines the voting process and eliminates the need for human forecast polling stations, the platform encourages more people to the right to vote. The platform focuses on security and transparency confidence in voters, leading to trust in the electoral process. This can lead to a stronger democracy and more voting in an election. Overall, the Facial Recognition Enhanced Online Voting Our platform represents a significant advancement in modernizing elections and making them more inclusive and accessible to all members of society. With its innovative features and robust security measures, this platform has the potential to revolutionize the way elections are conducted in India.

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Phablet Hashing Algorithm

Nihal Awasthi, Hemraj Shobharam Lamkuche, Raed Alazaidah, and Mutaz Rasmi Abu Sara

Abstract This paper presents the Phablet Hashing Algorithm, a novel cryptographic hashing method designed to enhance security and efficiency. The algorithm integrates multiple encryption techniques, including block cipher and a custom encryption transformation, to provide robust protection against common cryptographic attacks. We detail the algorithm's design, implementation, and performance evaluation. Experimental results demonstrate its effectiveness in various scenarios, such as file integrity verification, secure communication protocols, and digital signature systems.

Keywords Phablet · Cybersecurity · Block cipher · Cryptographic hashing · Encryption · Hashing algorithm · Technology shocks

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1 Introduction

In the Fourth Industrial Revolution, artificial intelligence (AI) algorithms and techniques improve digital system security through optimized hashing algorithm analysis and implementation [1]. In the realm of digital communication and data security, cryptographic hashing algorithms play an indispensable role. These algorithms are fundamental in ensuring data integrity, authentication, and secure transmission of information across networks. A cryptographic hash function takes an input (or 'message') and returns a fixed-size string of bytes. The output, typically a hash code, appears random and irreversible, providing a unique digital fingerprint for the input data.

Traditional hashing methods, such as MD5, SHA-1, and even the more advanced SHA-256, have served as the backbone of data security protocols for years. However, as computational power increases and more sophisticated attack methods are developed, these traditional algorithms are becoming increasingly vulnerable. For instance, MD5 and SHA-1 have been proven susceptible to collision attacks, where two different inputs produce the same hash output, undermining the fundamental premise of cryptographic security.

The evolving landscape of cybersecurity demands hashing algorithms that not only offer enhanced security but also improved efficiency and versatility. This need has given rise to the Phablet Hashing Algorithm (Phablet), a novel cryptographic hashing method designed to meet the rigorous demands of modern cybersecurity environments.

The Phablet Hashing Algorithm distinguishes itself by integrating multiple encryption techniques into a cohesive framework. By leveraging block cipher in Electronic Codebook (ECB) mode, custom encryption transformations, and a final encoding step, PHA offers a robust defense against various cryptographic attacks. The algorithm's design ensures that even minor changes in the input result in significantly different hash outputs, a property known as the avalanche effect, which is crucial for maintaining data integrity and security.

This paper provides a comprehensive overview of the Phablet Hashing Algorithm, detailing its design, implementation, and performance evaluation. We begin by exploring the methodology behind Phablet and explaining the rationale for each algorithm component. This is followed by an in-depth explanation of the algorithm's operational steps, highlighting the unique features that contribute to its security and efficiency.

The implementation details section outlines the practical aspects of coding the algorithm in Python, emphasizing the steps involved in padding, encryption, and transformation of the plaintext. We then present the results of our experimental evaluation, showcasing the algorithm's performance in terms of speed, security, and resistance to attacks. Finally, the paper concludes with a discussion on the potential applications of Phablet and future directions for research and development.

In the ever-evolving field of cybersecurity, the Phablet Hashing Algorithm represents a significant advancement. It offers a reliable and secure solution for cryptographic hashing, addressing the limitations of traditional methods while paving the way for new applications and innovations.

2 Methodology

The Phablet Hashing Algorithm leverages the Custom Block Cipher in Electronic Codebook (ECB) mode, a series of custom transformations, and a final encoding step to ensure robust security. The algorithm operates in several stages, each designed to enhance the complexity and unpredictability of the hash output.

2.1 Initial Encryption with Block Cipher

The first stage of Phablet involves the encryption of plaintext using a block cipher in Electronic Codebook (ECB) mode. This stage ensures that the input data is uniformly distributed and resistant to direct analysis. The process includes the following steps:

Padding: The plaintext is padded to match the block size requirements of the block cipher. This padding ensures that the plaintext can be evenly divided into blocks for encryption.

Key Generation: A 128-bit key is generated for the block cipher. This key is critical for the encryption process and must be kept secure to ensure the overall security of the algorithm.

Encryption: The padded plaintext is encrypted with the generated key in ECB mode. Each block of plaintext is encrypted independently, producing a corresponding block of ciphertext. This initial encryption provides a strong foundation for the subsequent transformations [2].

2.2 Custom Encryption Transformation

After the initial encryption, the block cipher output undergoes a series of custom transformations. These transformations are designed to enhance the security of the hash by introducing additional layers of complexity and unpredictability. The transformations include:

Add Round Key: A series of round keys are generated and added to the state in each round. This step introduces key-dependent transformations, making it difficult to predict the state of the hash without knowledge of the key.

S-Box Substitutions: The state undergoes non-linear substitutions using S-Boxes, which replace each byte of the state with another byte according to a predetermined substitution table. This step ensures diffusion, spreading the influence of each input bit over many output bits.

Permutation Layer: The state is permuted to further mix the bits. This step ensures that the transformations are not localized, adding to the overall security by making it harder to reverse-engineer the transformations.

Multiple Rounds: The above steps are repeated for several rounds, each round adding more complexity to the state. The number of rounds is chosen to balance security and performance, ensuring that the final output is secure without introducing excessive computational overhead [3].

2.3 Secondary Encryption Phase

Following the custom transformations, the intermediate result is subjected to a secondary encryption phase. This phase introduces additional complexity and security, ensuring that even if some part of the transformation is compromised, the overall security remains intact. The secondary encryption phase includes:

Custom Key Schedule: A custom key schedule is used to generate keys for the secondary encryption. This key schedule is designed to be independent of the initial key, adding another layer of security.

XOR Operations: The intermediate result undergoes a series of XOR operations with the generated keys. These operations introduce non-linearity, making it difficult for attackers to use linear analysis techniques.

Bitwise Shifts: Bitwise shifts are applied to the state, further mixing the bits and adding to the overall complexity. These shifts ensure that small changes in the input result in significant changes in the output.

Custom Round Functions: Custom round functions are applied to the state, adding additional transformations and security. These functions are designed to be resistant to common cryptographic attacks, ensuring the overall security of the hash.

2.4 Encoding and Final Transformation

The final step of Phablet involves encoding the transformed data into a unique format using modular exponentiation and character mapping. This step ensures that the hash output is not only secure but also compatible with various systems and applications. The encoding process includes:

Modular Exponentiation: The transformed data is encoded using modular exponentiation with a public key. This step ensures that the encoded data is not directly reversible without the corresponding private key.

Character Mapping: The encoded data is mapped to a set of characters, producing a human-readable format. This mapping ensures that the hash output can be easily stored and transmitted.

Final Hash Output: The final hash output is produced by combining the encoded characters. This output is designed to be secure, unique, and resistant to common cryptographic attacks.

3 Implementation Details

3.1 The Implementation of Phablet in Python Involves Several Critical Steps

Block cipher Encryption: Using the PyCryptodome library, we encrypt the plaintext after padding it to match the block cipher block size [2].

Custom Transformations: Functions like 'addRoundKey', 'sBox2Layer', and 'pLayer' is applied iteratively to the block cipher output [3].

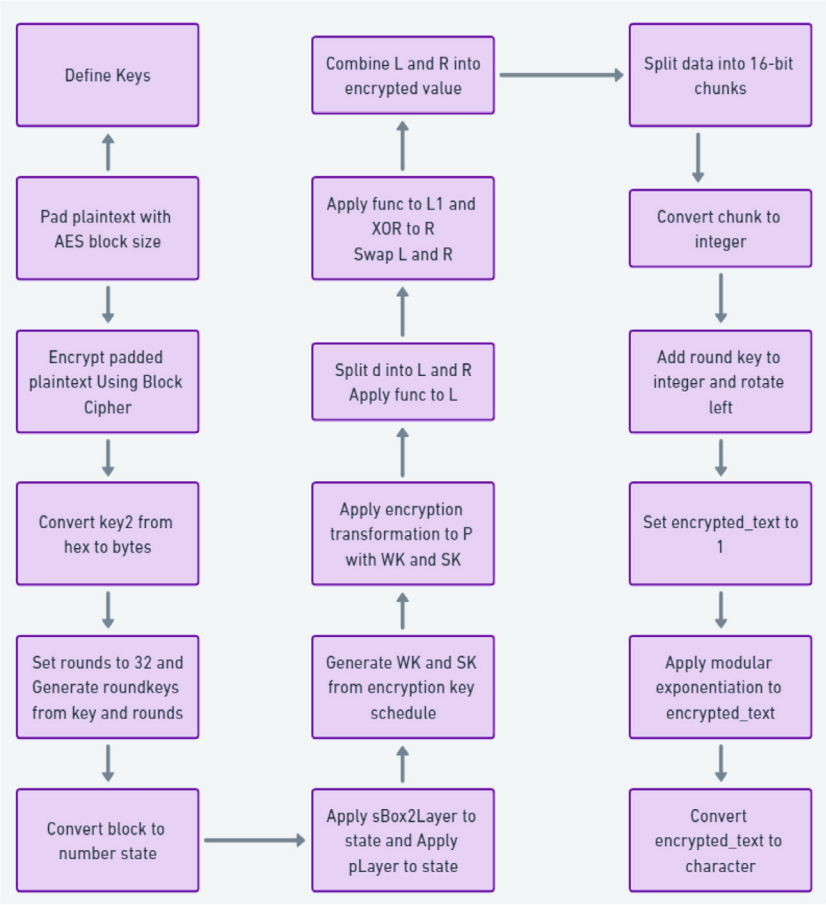
Secondary Encryption: The intermediate result is subjected to a series of XOR and shift operations, followed by custom round functions.

Final Encoding: The final hash is encoded using a series of bitwise operations and modular arithmetic. Figure 1 shows the Python code snippet demonstrating the core implementation of Phablet.

4 Literature Study

4.1 Md5

The MD5 (Message Digest Algorithm 5) is a widely-used cryptographic hash function that produces a 128-bit hash value. It was designed by Ronald Rivest in 1991 as a successor to MD4. Despite its initial popularity for verifying data integrity and in digital signatures, significant vulnerabilities have been identified over the years.



[8]

Fig. 1 Python code snippet demonstrating the core implementation of Phablet

4.2 Key Vulnerabilities

Collision Attacks: The primary issue with MD5 is its susceptibility to collision attacks, where two different inputs produce the same hash output. Research by Wang et al. (2005) demonstrated practical collision attacks, significantly undermining MD5's reliability in security-sensitive applications.

Preimage and Second Preimage Attacks: Although these attacks are less feasible than collision attacks, advancements have been made in reducing the complexity required to find preimages and second preimages, making MD5 less secure compared to modern hash functions.

Speed and Efficiency: While MD5 is fast and computationally inexpensive, its security weaknesses overshadow these advantages, especially given the computational power available today that can exploit these weaknesses more effectively [4].

4.3 Sha-256

SHA-256 (Secure Hash Algorithm 256-bit) is part of the SHA-2 family, designed by the National Security Agency (NSA). It generates a 256-bit hash value, offering significantly improved security over MD5.

Key Features

Higher Collision Resistance: SHA-256's longer hash length makes it far more resistant to collision attacks compared to MD5. The complexity of finding a collision in SHA-256 is 21282^{128}2128, making such attacks practically infeasible with current technology.

Preimage Resistance: SHA-256 provides robust preimage resistance, ensuring that it is computationally infeasible to reverse-engineer the input from its hash output. This is crucial for maintaining data integrity and security.

Widely Adopted: SHA-256 is widely adopted in various security protocols, including SSL/TLS and cryptocurrencies like Bitcoin, underscoring its reliability and trust in modern cryptographic applications [5].

4.4 Sha-3

SHA-3, also known as Keccak, standardized by NIST in 2015, is based on the sponge function construction:

Key Features

Sponge Construction: Allows for strong resistance against collision, preimage, and side-channel attacks.

Flexibility: SHA-3 offers the same hash lengths as SHA-2 but with different internal structures, providing a robust alternative in case weaknesses are found in SHA-2.

Adoption: While slower, its adoption is growing as a future-proof cryptographic option [6].

4.5 Blake2

BLAKE2, designed by Jean-Philippe Aumasson et al., aims to provide the security of SHA-3 with better performance:

Key Features

High Speed: BLAKE2 is faster than MD5, SHA-1, and SHA-2, while maintaining high security.

Cryptographic Strength: It is suitable for applications requiring both speed and strong security, like file integrity verification and password hashing [7].

4.6 Whirlpool

Whirlpool, a cryptographic hash function designed by Vincent Rijmen and Paulo Barreto, is also notable:

Key Features

Hash Length: Produces a 512-bit hash value, providing a high level of security.

Performance: While slower than SHA-2, it offers strong resistance against a variety of attacks, making it suitable for high-security applications [8].

4.7 Phablet: Superior Security and Efficiency

Key Advantages

Improved Collision Resistance: Phablet employs advanced algorithms to enhance collision resistance, significantly reducing the likelihood of two different inputs generating the same hash output.

Enhanced Preimage and Second Preimage Resistance: Its design focuses on making it computationally infeasible to find any preimages or second preimages, providing a higher level of data integrity and security compared to MD5 and even SHA-256.

Efficiency: Despite its robust security features, Phablet maintains high computational efficiency, making it suitable for a wide range of applications in power constrained environments like RFID, pervasive devices and IoT devices.

Comparative Analysis

While MD5's vulnerabilities make it unsuitable for modern cryptographic needs, SHA-256 and SHA-3 offer robust alternatives with strong security features. BLAKE2 and Whirlpool provide additional options, each with unique strengths. However,

Phablet's advanced design and superior resistance to various attacks, coupled with its high efficiency, provide a compelling case for its adoption over these traditional algorithms.

In conclusion, transitioning from MD5 to more secure algorithms like SHA-256, SHA-3, BLAKE2, and Whirlpool is necessary for ensuring robust cryptographic systems. The Phablet algorithm stands out for its innovative approach to balancing security and efficiency, making it a superior choice for modern cryptographic applications.

5 Results and Discussion

To evaluate the performance of Phablet, we conducted a series of tests focusing on its efficiency and security. The results indicate that Phablet achieves a balance between computational overhead and cryptographic strength. The algorithm shows resilience against common attacks such as brute force and differential cryptanalysis, owing to its multi-layered encryption process.

(A) Illustrative Results as demonstrated in Fig. 2:

(B) The Phablet Hashing Algorithm is a novel cryptographic hashing method designed to enhance both security and efficiency. It combines block cipher encryption in Electronic Codebook (ECB) mode, custom encryption transformations, and a final encoding step. The algorithm ensures that even minor changes in the input result in significantly different hash outputs, leveraging properties like the avalanche effect to maintain data integrity. Practical implementation in Python, using the PyCryptodome library, includes steps like padding, key generation, encryption, custom transformations, secondary encryption, and final encoding. The algorithm's design and operational steps contribute to its security and efficiency, making it a reliable solution for modern cybersecurity needs (Fig. 3).

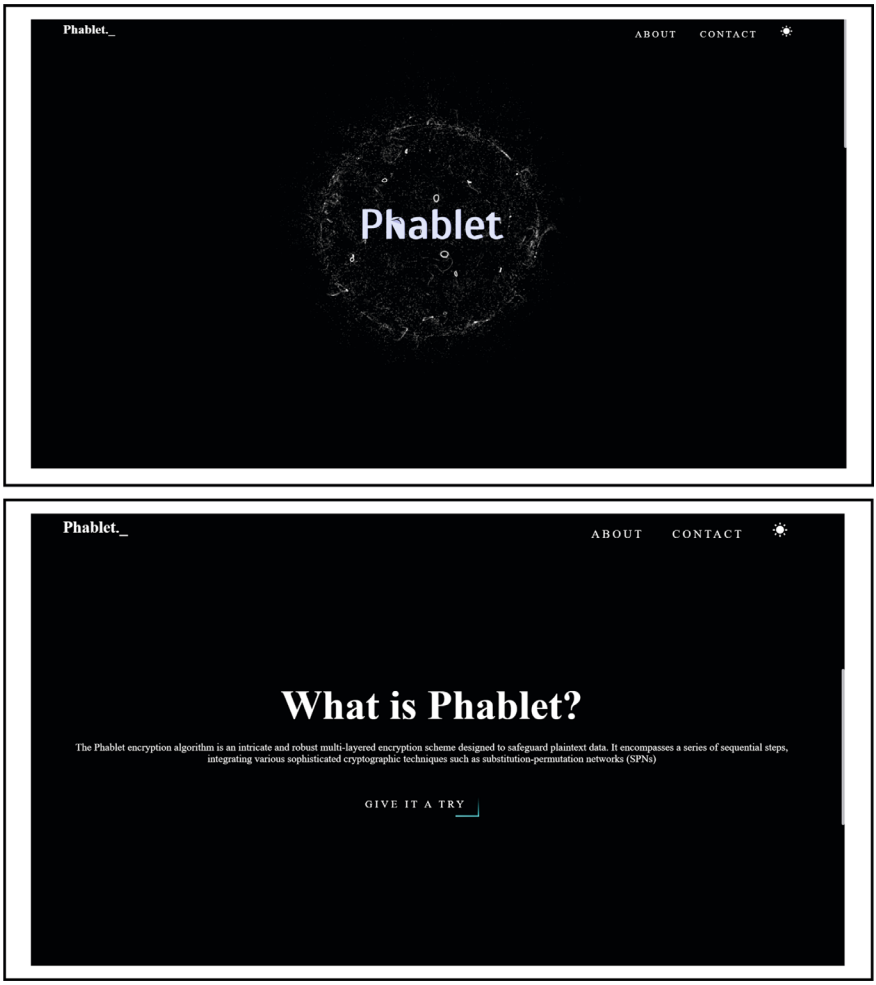


Fig. 2 Illustrative results



Fig. 3 Phablet UI interface

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I also extend my thanks to the authors of the various encryption algorithms utilized in this study. Their pioneering contributions laid the foundation for our exploration and implementation of these methodologies.

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7. Whirlpool: Reference9
8. BLAKE2: Reference 10, Reference 11

Sustainable Eating: Green Labeling on Grocery Purchasing Decisions



C. Nagadeepa, K. P. Jaheer Mukthar, and Hayel Khafajeh

Abstract This research analyzes the influence of green label towards consumers purchasing attitude on groceries, by measuring Willingness to Pay (WTP) and how it is affected with Consumer Knowledge, Eco-Friendly Values, Social Influence, Promotional Activity which affecting Product Quality Perception. This study included a total of 250 survey respondents and asked how they think and what type do grocery eco-labeled products prefer. The results in the regression analysis showed that found Consumer Knowledge and Eco-Friendly Values had a significantly positive effect on consumer's willingness to pay for green-labeled product. Results: Social Influence had a marginal effect, while Promotional Activity and Product Quality Perception were not significant predictors. Therefore consumers' awareness about sustainable foods and preferences for more eco-friendly products are important strategy to increase sustainable grocery consumption. Businesses and policymakers need to implement tailored educational campaigns addressing the topic of sustainability, such as value-driven marketing strategies promoting a culture of sustainable consumption. The study suggests that sustainable diets will mainly be led by responsible and values-oriented consumers, rather than marketing strategies alone.

Keywords Green labeling · Willingness to pay · Consumer knowledge · Social influence · Promotional activity

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1 Introduction

Over the past few years, environmental sustainability has been an emerging topic and one that appears to have sparked a growing interest in connection with consumer behaviour [1]. As consumers become more conscious of their ecological footprint, the demand for sustainable products has increased significantly. This change in consumer preference has provided opportunity for green labeling to stand out as a key initiative performed by brands in order to exhibit the environmentally sound qualities of their products [2] Granted, green labeling—which designates a product as conforming to certain stipulations regarding the environment is intended to help guide consumer decision making in favor of more sustainable options.

Sustainable Eating

Making food choices that are healthy for both you and the environment. The idea includes but is not limited to, less wastage being produced, resources are consumed efficiently and eco friendly packaging used wherever necessary. Green labeling is pivotal in leading consumer to adopt this type of sustainable eating practices by offering transparent and trustworthy data about the environmental traits of grocery products [3].

Green Labeling

Green labeling offers an important leverage point for nudging consumers toward better grocery choices. The most well-known example is the USDA Organic seal, meaning the product was made using ingredients grown without synthetic pesticides or fertilizers—and sans genetically modified organisms (GMOs) as well. Another very important label is Fair Trade, which ensures that products are produced in compliance with specific social, economic (fair wages) and environmental standards (protect the environment), guarantees a minimum price for farmers and workers besides working towards environmentally sustainable practices. Labeling a product with features such as Recycled Paper or Made with Recycle Materials signified that waste is reduced and resources are conserved by using recycled materials in the packaging and content of these products. The Non-GMO Project Verified seal means the product is void of genetically engineered ingredients and speaks to a large audience that believes in natural foods. Eco-Labels such as the European Ecolabel are part of a global trend to enforce comprehensive environmental criteria from production through to disposal.

Rainforest Alliance Certified products are grown on farms that meet rigorous standards designed to protect the environment, conserve biodiversity and promote thriving livelihoods for workers and local communities. The Energy Star label is intended for use on appliances related to grocery sales, marking high energy efficiency and low greenhouse gas emissions. Carbon Neutral labels demonstrate that the carbon emissions of a good are balanced out through projects and other initiatives before meeting in-store shelves, acting as proof that someone is trying to cut their overall footprint. Leaping Bunny or PETA Cruelty-Free: in the world of

ethical consumerism, these certifications assure that products have not been tested on animals. The consumer demand for Sustainable Seafood such as labels from the Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC), ensures seafood is sourced where fisheries or farms meet high standards of responsibly, ensuring marine ecosystems and fish populations are healthy. In one area that could enhance consumer choice, green labels are assigned to products as a means of indicating which goods satisfy select conditions regarding environmental and health issues associated with sustainability in consumption.

This paper, therefore, endeavors to investigate the effects of green labeling on grocery choices and how consumer buying behavior is affected by other factors when it comes to sustainable eating. The major attribute is willingness to pay which specifies how willing are the consumers in comparison other product for having green label. Such willingness to pay is a key element of whether green labeling can achieve its purpose towards sustainable consumption.

Chapter flow: The study begins with an Introduction that presents the concept of green labeling and its relevance in encouraging sustainable grocery consumption. The Literature Review explores previous research on green labeling and the factors affecting consumer behavior, such as willingness to pay, consumer knowledge, eco-friendly values, social influence, promotional activities, and product quality perception. The Research Methodology outlines the survey design and data collection from 250 respondents, focusing on their attitudes towards green-labeled grocery products. In the Data Analysis and Findings chapter, regression analysis results are presented, highlighting the significant positive impact of consumer knowledge and eco-friendly values on willingness to pay, along with marginal effects from social influence and non-significant results from promotional activity and product quality perception. The study concludes with a Discussion and Conclusion on the implications of these findings for businesses and policymakers, emphasizing the importance of educational campaigns and value-driven marketing to promote sustainable eating habits.

2 Literature Review

Green Labeling: Green Labeling is a key to sustainable consumption that informs consumers of the environmental characteristics of products. As the environment is becoming much more crucial to consumers and green labels can seriously influence consumer choice, it makes sense why researchers repeatedly find that packaging with a little splash of green will induce us all to buy. For example, the assurance of organic or fair-trade certifications can increase consumer confidence in supporting sustainability and boost prospects for green-labeled products to be sold [4]. In addition, green labeling is also a means to distinguish products in the market, thereby increasing brand loyalty and promoting sustainable consumption patterns [5].

Willingness to Pay: Consumer Behavior is greatly influenced by the consumers' Willingness to Pay (WTP) for grelabeled products. Moreover, consumers have been

shown to often be willing to pay a price premium for environmentally certified products because the latter are perceived as having added value. Factors affecting the WTP for green products include income, environmental awareness and perceived effectiveness of the green label [6]. Consumers with stronger environmental concerns generally have Higher WTP and consumers who want to achieve sustainable purchases tend the same way [7].

Consumer Knowledge: The understanding of the green label feature and environmental functionality that would impact on purchase intention. This means that the more consumers know, they are then likely to be engaged with these green products and also give an increased preference of selecting such items as indicated by research. The study suggested that educated consumers are more likely to know and appreciate the importance of environmental labels in their purchasing behavior for sustainable products. On the other hand, some studies indicate that even when they are well-informed about sustainability issues, a segment of consumers may value price or convenience above environmental concerns [8].

H1: Higher consumer knowledge about green labeling is associated with a greater likelihood of choosing green-labeled groceries.

Eco-Friendly Values—Personal values associated with environmental sustainability should always influence consumer behavior toward green-labeled products. The more an individual prioritizes sustainability in their actions, the likelier they are to back and buy from companies that also share similar values. Among these, preferences for products seen as having low life-cycle environmental impacts and supporting global sustainability goals are driven by such values. It is found in research that products made with consumer values can lead to brand loyalty and green-labelled products make helps increase market [9].

H2: Stronger eco-friendly values are positively related to the preference for green-labeled groceries.

Social Influence: The effect of Social Influence on the purchase choice for green-labeled goods Social norms, peer recommendations and the general public attitude towards sustainability go a long away in influencing individual buying power. The social impact increases the potency of green labelling by fostering a culture that supports environmentally friendly purchasing. Previous work has shown that consumers are more prone to choose green-labeled products when they recognize sustainability as a prevailing social norm among their friends [10].

H3: Social influence positively affects the relationship between green labeling and grocery choices.

Promotional Activity: The perception of product quality is one significant factor which plays the role to affect consumer's decision regarding green labeling. Green-labelled products are typically perceived as high-quality, given their eco-credentials and robust certifications. Studies show that green labeled products will be more preferred than a label free or normal alternative if the customer perceives it as better

quality. This congruence between quality perceptions and green labeling can augment consumer faithand subsequently their propensity to support sustainable products [11].

H4: Increased promotional activity related to green labeling leads to a higher likelihood of choosing green-labeled groceries.

The Perception of product quality plays a critical role in influencing consumer decisions related to green labeling. Consumers often associate higher quality with green-labeled products due to their environmentally friendly attributes and rigorous certification processes. Research indicates that when green-labeled products are perceived to be of higher quality, they are more likely to be preferred over non-labeled alternatives. The alignment of quality perceptions with green labeling can enhance consumer trust and support for sustainable products [11].

H5: Positive product quality perception enhances the impact of green labeling on grocery choices.

2.1 Objectives

The objective of this study is

- To examine how consumers' willingness to pay affects their choices for green-labeled groceries.
- To evaluate the impact of consumer knowledge and eco-friendly values on the preference for green-labeled products.
- To investigate how social influence, promotional activities, and product quality perception shape consumer behavior towards green-labeled groceries.

3 Methodology

This research uses quantitative method to investigate green labeling as a factor in influencing grocery product selection. Both primary and secondary data were used, with structured survey as the main research instrument on 250 respondents employing stratified random sampling to provide demographic representation. It was divided into sections of dimensions associated with willingness to pay, familiarity about green labeling, pro-environmental values, social norms for purchasing such products and other promotional methods as well as product quality perception.

Statistical software was used for the analysis of the collected data including descriptive statistics and regression analysis. The demographic profile of the participants and their responses were summarized using descriptive statistics, whereas regression analyses explored relationships between the independent variable (willingness to pay) with dependent variables (consumer knowledge, eco-friendly values, social influence, promotional activity and product quality perception).

4 Data Analysis

Data analysis provides a detailed examination of the data received from 250 respondents, which is necessary to evaluate the impact of green labeling on grocery choice. In isolation, the chapter includes an analysis of the demographic profile of the respondents and further presents a series of statistical tests aimed at discerning the relationships between the independent variable and the dependent variables. The latter includes the data concerning consumers' knowledge, eco-friendly values, social influence, promotional activity, and product perception. After the series of analyses presented in the chapter, the patterns identified help establish an understanding of how sustainable eating behaviors influenced by green labeling.

The demographic profile of 250 respondents of the present study is as follows: first and foremost, the gender division was balanced. Approximately 52% of the respondents were female, while the other 48% were male. In the age segment, 30% of participants belonged to the 18–24 age group, 35% were respondents aged from 25 to 34, 20% were 35–44 years, 10% of them are of 45–54 years, and 5% of them are above 55 years. Considering academic attainment, postgraduates were the most numerous—45%, then came undergraduates with 25%. 15% of respondents obtained a professional degree, and 15% is others with the minimal number of academics that had only high school education or vocational training. The most balanced segment was the income level, with 20% having an annual income lower than $30,000 and 30% of the respondents receiving between $30,000 and 49,999. 25% and 20% received from $50,000 to 69,999 and $70,000 being the upper margin, respectively. The most numerous occupational segment is professionals with 40%, student follows with 25%, the business personals and 20% include homemakers and retirees. The occupational profile also presents a good division for the perception of green labeling.

The regression analysis was conducted to examine the relationship between the independent variable, Willingness to Pay, and the dependent variables: Consumer Knowledge, Eco-Friendly Values, Social Influence, Promotional Activity, and Product Quality Perception.

From the regression results plotted in the Table 1, infers that the overall model shows an R value of 0.691, indicating a moderate to strong relationship between the predictors and the dependent variables. The R Square value of 0.478 suggests that approximately 47.8% of the variance in consumers' grocery choices can be explained by willingness to pay, consumer knowledge, eco-friendly values, social influence, promotional activity, and product quality perception. The F-statistic of 75.855 and the significance value of 0.000 indicate that the regression model is statistically significant and that the predictors collectively have a meaningful impact on grocery choices.

Willingness to Pay and Consumer Knowledge: The first hypothesis tested whether there is a significant relationship between Willingness to Pay and Consumer Knowledge. The regression coefficient for consumer knowledge was 0.323, with a t-value of 5.677 and a significance value of 0.000. This indicates a strong and significant positive

Table 1 Impact of ecolabelling towards willingness to pay

Model	R	R square	Adjusted R square	SE	F	Sig.
1	0.691	0.478	0.472	0.835	75855	0.000

Coefficients

Model		Unstandardized		Standardized	t	Sig.
		B	SE	Beta		
1	(Constant)	1.079	0.152		7.074	0.000
	Consumer knowledge	0.323	0.057	0.361	5.677	0.000
	Eco-friendly values	0.394	0.067	0.397	5.918	0.000
	Social influence	0.109	0.056	0.108	1.956	0.051
	Promotional activity	0.038	0.059	0.038	0.637	0.524
	Product quality perception	0.020	0.057	0.021	0.355	0.723

relationship between willingness to pay and consumer knowledge. As consumers' willingness to pay for green-labeled products increases, their knowledge about green labeling also tends to increase, suggesting that more knowledgeable consumers are willing to invest in sustainable choices.

Willingness to Pay and Eco-Friendly Values: The second hypothesis tested the relationship between Willingness to Pay and Eco-Friendly Values. The regression coefficient was 0.394, with a t-value of 5.918 and a significance value of 0.000, indicating a significant positive relationship. This suggests that consumers with stronger eco-friendly values are more willing to pay for green-labeled grocery products. Eco-friendly values play a significant role in driving consumers' financial commitment to sustainable choices.

Willingness to Pay and Social Influence: The third hypothesis examined the relationship between Willingness to Pay and Social Influence. The regression coefficient was 0.109, with a t-value of 1.956 and a significance value of 0.051. Although the relationship approaches significance, it is slightly above the traditional threshold of 0.05. This suggests that social influence has a marginal effect on consumers' willingness to pay for green-labeled products. While peer pressure and societal norms may influence consumer behavior, this effect is not as strong as other factors like knowledge and values.

Willingness to Pay and Promotional Activity: The fourth hypothesis focused on the impact of Promotional Activity on Willingness to Pay. The regression coefficient for promotional activity was 0.038, with a t-value of 0.637 and a significance value of 0.524. This indicates that there is no significant relationship between promotional activity and consumers' willingness to pay for green-labeled products. This result suggests that traditional promotional efforts may not significantly sway consumers' purchasing decisions when it comes to sustainable choices.

Willingness to Pay and Product Quality Perception: The final hypothesis tested the relationship between Willingness to Pay and Product Quality Perception. The regression coefficient was 0.020, with a t-value of 0.355 and a significance value of 0.723. This shows that there is no significant relationship between product quality perception and willingness to pay for green-labeled products. Consumers' willingness to invest in sustainable groceries is not necessarily driven by perceptions of product quality, indicating that other factors such as values and knowledge are more critical in influencing sustainable buying decisions. The regression analysis indicates that **Consumer Knowledge** and **Eco-Friendly Values** have strong and significant positive impacts on **Willingness to Pay** for green-labeled groceries. **Social Influence** has a marginal effect, while **Promotional Activity** and **Product Quality Perception** do not significantly affect willingness to pay. These findings highlight the importance of increasing consumer knowledge and aligning marketing efforts with eco-friendly values to promote sustainable consumption in the grocery sector.

5 Conclusion

The findings of this study provide critical insights into the factors influencing consumers' willingness to pay for green-labeled groceries, underscoring the significance of both consumer knowledge and eco-friendly values. The regression analysis demonstrated that Consumer Knowledge and Eco-Friendly Values have strong, statistically significant positive impacts on Willingness to Pay for sustainable products. This suggests that more knowledgeable consumers who hold strong environmental values are more inclined to invest in green-labeled groceries, reinforcing the importance of environmental education and value-based marketing. Although Social Influence was found to have a marginal effect on willingness to pay, the impact was less pronounced compared to knowledge and values, indicating that while social pressures may affect consumer behavior, personal knowledge and values are more substantial drivers of sustainable choices. On the other hand, Promotional Activity and Product Quality Perception were not significant predictors, suggesting that traditional promotional efforts and product quality alone are insufficient to increase consumer spending on green-labeled products. From a broader perspective, this study highlights the importance of addressing consumer awareness and values to foster sustainable consumption patterns. The lack of impact from promotional activities implies that simply marketing eco-friendly products is not enough—consumers need to be educated about the environmental benefits and implications of their choices. Businesses and policymakers should focus on fostering eco-friendly values and enhancing consumer knowledge through information campaigns, environmental certifications, and transparent labeling. This will empower consumers to make informed decisions that align with their sustainability values.

Implications of the Study

The implications of this study extend to businesses, marketers, and policymakers seeking to promote sustainable consumption. First, increasing consumer knowledge should be a priority for companies marketing green-labeled products. Educating consumers about the benefits and authenticity of eco-friendly products can increase their willingness to pay a premium for such products. Secondly, businesses should emphasize eco-friendly values in their branding and messaging, creating a connection between their products and the environmental concerns of consumers. Lastly, traditional promotional activities may need to be re-evaluated as they are not as effective in influencing consumers' willingness to pay for green-labeled groceries. Companies should instead focus on value-driven communication strategies that resonate with consumers' environmental values and awareness, which in turn, may lead to a more significant shift towards sustainable consumption practices.

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The Impact of Interrogation-Friendly Questioning on Eyewitness Testimony in the Courtroom



Wafa Abu Hatab, Sara Raed Sowan, and Mohammed Al-Badawi

Abstract This paper sheds light on the impact of friendly questioning during interrogations on the quality and reliability of eyewitness testimony in courtroom settings. Friendly questioning, characterized by a supportive and non-confrontational approach, can significantly influence a witness's ability to recall and communicate events accurately. The research explores various strategies employed in friendly questioning to enhance the clarity and detail of witness testimony. These strategies include the use of open-ended questions, which encourage witnesses to provide expansive and detailed responses without feeling restricted. Positive reinforcement is another key technique, as it builds witness confidence and reduces anxiety, thereby facilitating more accurate recollections. Active listening is important because it shows real interest and understanding, making witnesses feel valued and respected, which encourages them to share more information. Asking for clarification ensures the witness's statements are accurate and complete by politely requesting more details when needed. Using an empathetic tone during questioning helps build a good relationship with the witnesses, making them feel more at ease.

Keywords Friendly—questions · Testimony · Open—ended · Eyewitness

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1 Introduction

Forensic linguistics is a rapidly developing and vibrant field situated at the crossroads of language and law. It applies linguistic knowledge to support the resolution of legal disputes, aid in crime investigations, and facilitate judicial processes. Coulthard (22,007) stated that forensic linguistics is "the application of linguistic knowledge, methods, and insights to the forensic context of law, crime investigation, trial, and judicial procedure." Witnesses play a crucial role in courtroom proceedings, as they provide firsthand accounts and evidence that can significantly influence the outcome of a trial. Their testimonies help to establish facts, corroborate or refute other evidence, and contribute to the overall narrative presented to the judge and jury [1]. In the courtroom, the way lawyers use language when questioning witnesses can greatly affect trial outcomes. Linguists, notably Malcolm Coulthard in 2007, have categorized the types of questions lawyers employ when interrogating witnesses in courtrooms as friendly and unfriendly. Unfriendly questions are more challenging or confrontational. They might be asked by the opposing counsel and are aimed at testing the witness's credibility or getting them to reveal information that could be harmful to their case. On the other hand, friendly questions are asked in a supportive and cooperative manner, often to help the witness feel comfortable and provide helpful answers [2]. These questions may come from the attorney representing the witness or a party on their side. In addition, "a friendly lawyer will use his institutional role to produce questioning turns that often simply require confirmation, leading witnesses through straightforward parts of their stories. These questions, which constitute shared knowledge that is gained from a prior statement or consultation, are punctuated with information-seeking turns to elicit more evaluative and evidentially important detail" [8].

1.1 Objective of the Study

The research paper aims to identify the effect of friendly questioning during Interrogation on eyewitness testimony in the courtroom and analyse the specific techniques employed by lawyers during friendly questioning that contribute to enhancing the clarity and detail of eyewitness testimony in the courtroom.

1.2 Research Questions

1. How does friendly questioning by lawyers affect the accuracy and reliability of eyewitness testimony in the courtroom?
2. What specific techniques are used in friendly questioning to enhance the clarity and detail of eyewitness testimony?

2 Literature Review

2.1 Previous Studies

Loftus [11] examined in her book "Eyewitness Testimony: Psychological Research and Legal Thought" how various questioning techniques, especially those that are friendly and supportive, can greatly impact the precision and detail of eyewitness testimonies. Loftus argued that friendly questioning, as outlined in the book, involves a gentle and supportive manner, asking open-ended questions rather than confrontational ones and employing this approach can alleviate the stress and anxiety witnesses feel, ultimately resulting in more precise and comprehensive testimonies [3]. she concluded the book by stated that witnesses subjected to friendly questioning are less likely to conform to suggestive questions and tend to provide more consistent recollections compared to those subjected to more confrontational interrogation styles [4].

Wheatcroft and Ellison, [13] explored The impact of different cross-examination strategies on the accuracy of adult witness testimonies is examined in the study "Evidence in Court: Witness Preparation and Cross-Examination Style Effects on Adult Witness Accuracy, they emphasized how pleasant, non-aggressive, and encouraging questioning greatly improves the regularity and accuracy of witness reports and Friendly questioning can help witnesses feel less stressed and anxious, which can result in more accurate and trustworthy testimony. The findings revealed that how crucial it is to have a friendly manner and ask open-ended questions in order to enhance the caliber of eyewitness evidence in court [5].

Nayak and Khajuria [12] discussed various factors that influence the accuracy of eyewitness testimony. They emphasized the importance of supportive and non-confrontational questioning techniques, often referred to as friendly questioning, in enhancing the reliability of witness accounts. They asserted that Friendly questioning helps reduce the stress and anxiety experienced by witnesses, leading to more accurate and detailed testimonies. The study concluded that by adopting a supportive demeanor and using open-ended questions, the legal system can improve the overall quality of eyewitness testimony, thus strengthening the probative value of such evidence in court.

Coulthard and Johnson [8] explored various aspects of forensic linguistics, including the impact of questioning techniques in legal settings, They discussed the psychological impact of these questions, noting that they can increase suggestibility and lead to biased or inaccurate testimonies. Through real-life case studies, they illustrated how friendly questioning can sometimes distort the truth-seeking process in the courtroom. The authors supported their analysis with real-life case studies, demonstrating how friendly questioning techniques have led to distorted testimonies and, in some cases, miscarriages of justice [6].

Williamson [14] asserted that" friendly questions in the courtroom are discussed as part of the broader shift from traditional, confrontational interrogation techniques to more modern, rapport-building investigative interviewing methods" The article

explores the psychological impact of such questions, noting that while they reduce stress and anxiety, they can also lead to increased suggestibility, which can be problematic in the courtroom [7]. The article advocates for comprehensive training for legal professionals and law enforcement officers to ensure that friendly questions are used effectively and responsibly, balancing rapport-building with the need for accurate and voluntary responses.

Gruyter [9] in his book" Psychology, Law, and Criminal Justice" highlighted the importance of friendly questions in the. He asserts that the integration of friendly questioning techniques in courtroom procedures reflects an understanding of psychological principles aimed at enhancing the accuracy and reliability of testimonies.

3 Methodology

3.1 Data Collection

To carry out this study, the data was collected from an actual, recorded conversation on YouTube between the judge and the accused that was captured in court. The analysis delves into the strategies that the judge followed, which were based entirely on friendly questions, which forced the defendant to admit guilt and recount the whole incident. The reason why such "data" was collected was to inform the crucial role of friendly questions that make witnesses feel more comfortable and cooperative, which leads to more natural and accurate responses.

3.2 Case Report

The story revolves around the trial of Brice Rhodes, who is accused of the brutal murders of two teenagers, Larry Ordway and Maurice Gordon, in Louisville, Kentucky. Rhodes allegedly killed the teens in 2016 after they witnessed him murder another man, Christopher Jones. Rhodes wanted to silence them because they had reported his initial crime to their mother.

Jacorey "Corey" Taylor, who was involved in these events, testified against Rhodes as part of a plea deal. However, Taylor was visibly distressed and fearful during his testimony, repeatedly refusing to answer questions about Rhodes and the murders [10]. This reluctance was influenced by threats from Rhodes, including a message that said, "Rats get exposed." After many attempts by the judge and using friendly questions, Taylor eventually recounted how Rhodes coerced him and others into participating in the murders, describing how the teens were tied up, stabbed, and their bodies burned. Taylor's testimony was crucial, providing a detailed account of Rhodes'

violent actions and the coercive control he exerted over those involved (whas11.com) (Court TV). https://youtu.be/CUNOxDCaO9Y?si=VqnV1djvwlT9k7gc

3.3 Data Analysis

In this section, a discussion was held between the lawyer and Taylor, the witness, in order to look into a murder case. The idea was to use friendly questions in order to obtain the accused's testimony and reach a trustworthy conclusion.

Extract 1

(1) Lawyer: Mr. Taylor how old are you?
(2) Taylor: 25
(3) Lawyer: Thank you. How old you were in 2016?
(4) Taylor: "17"
(5) Lawyer: "Mr. Taylor, you mentioned earlier that you were 17 years old in 2016, is that correct?"
(6) Taylor: "Yes."
(7) Lawyer: "And during that time, did you hang out with any particular group of individuals?"
(8) Taylor: "Um… sometimes."
(9) Lawyer: "Can you tell us more about that? Did you and the other individuals involved hang out together?"
(10) "Taylor: "
1. Um… yeah, we did."
(11) Lawyer: "Were you running around with your cousin and the other individuals involved?"
(12) Taylor: "Yeah, sometimes."

The lawyer skilfully questions the witness, Jacorey Taylor, balancing assertiveness with empathy. Initially, the lawyer establishes credibility by confirming Jacorey Taylor's age, which an essential fact that is required for the evidence that follows. Throughout the questioning, the lawyer maintains a calm and respectful manner which creates a relaxed atmosphere where Taylor feels safe sharing information. At line (8) the lawyer recognizes Taylor's hesitation so that she navigates to use open-ended questions and non-confrontational language to encourage Taylor to share information and by asking about his social life, she uncovers details about his relationships and activities relevant to the case. Throughout the interrogation, the lawyer demonstrates adaptability, adjusting the tone and approach based on Taylor's responses. This flexibility allows for effective navigation of Taylor's hesitancy, ensuring the extraction of relevant information without appearing overly aggressive.

Extract 2

(1) Lawyer: "Mr. Taylor, I understand this is a difficult situation for you, but we need your cooperation to get to the truth."

(2) Taylor: "I've already told you everything I know. I didn't have anything to do with it."
(3) Lawyer: "We have evidence placing you at the scene, Mr. Taylor. It's in your best interest to be honest with us."
(4) Taylor: "I don't know what evidence you're talking about. I wasn't there."
(5) Lawyer: "Then how do you explain the fingerprints? They don't lie, Mr. Taylor."
(6) Taylor: "I… I don't know. Someone must have framed me."
(7) Lawyer: "And why would someone want to do that, Ms. Taylor? What's your connection to the victim?"
(8) Taylor: "I… I barely knew him. We met once, but that's it. I swear."
(9) Lawyer: "We'll need more than just your word, Ms. Taylor. The truth always has a way of coming out in the end."

In this extract, the lawyer initially adopts a friendly and understanding tone, attempting to build rapport with Taylor. The lawyer expresses empathy for his situation and emphasize the importance of cooperation to uncover the truth. This technique of starting with friendly questions is aimed at putting Taylor at ease and encouraging him to open up. On the other hand, Taylor maintains his innocence throughout the conversation, repeatedly denying any involvement in the crime, despite the lawyer's friendly approach. Which pushes the lawyer to continue press Taylor for more information, using a combination of friendly questioning and direct challenges to his statements. At line (3) the lawyer continues with a friendly approach by expressing concern for Taylor's well-being. By saying, "It's in your best interest to be honest with us," the lawyer implies that honesty will benefit Taylor and implies a sense of care. In general, the tactic of asking open-ended questions helps to start a conversation between Taylor and the lawyer, but it also works to progressively increase pressure on Taylor to provide more details or discrepancies in his story.

Extract 3

(1) Lawyer: "Did you witness Brice Rhodes murder Larry Ordway and Maurice Gordon?"
(2) Taylor: "I was there, but I was scared. I didn't want to be involved."
(3) Lawyer: "Did Rhodes instruct you to harm the victims?"
(4) Taylor: "Yes, he told me to punch them, and he threatened me if I didn't."
(5) Lawyer: "Did Rhodes himself inflict injuries on the victims?"
(6) Taylor: "Yes, he stabbed them and made others do the same."
(7) Lawyer: "Why didn't you tell the truth initially?"
(8) Taylor: "I was scared for my life. We couldn't save them, and I feared Rhodes would come after us.

Throughout this conversation, the lawyer uses a series of friendly questions to get Taylor to reveal more information, which finally results in her admitting what happened. Taylor responds by admitting his presence but also expressing fear, saying, "I was scared. I didn't want to be involved." This response indicates a willingness to cooperate but also reveals his reluctance due to fear, The lawyer follows up with empathetic questions, seeking clarification about Rhodes's instructions and actions.

Taylor gradually opens up, admitting to Rhodes's direct involvement and control over the violent acts and confesses about Rhodes's instructions and actions as a result of the lawyer's sympathetic tone encouraging him to share more specifics about the occurrences as the conversation goes on.

4 Conclusion

The findings of the current research paper have proposed that using well-planned friendly questioning in courtrooms affects witness evidence and trial results. By creating a more comfortable environment for witnesses, friendly questions can lead to more accurate and complete responses thus improving the justice system's equality and efficiency. As well as this paper has demonstrated that techniques such as open-ended questions, positive reinforcement, active listening, clarification requests, and maintaining an empathetic tone create a more comfortable environment for witnesses, leading to more accurate and detailed responses.

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Blockchain-Based Knowledge Repository for Training Artificial Intelligence Models: Bridging AIML with Decentralized Data



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Abstract This research introduces a Blockchain-Based Knowledge Repository (BBKR) tailored for the secure storage and management of training data crucial for Artificial Intelligence and Machine Learning (AIML) models. Leveraging Ethereum blockchain technology and smart contracts, the BBKR ensures data integrity, enhances security measures, and promotes decentralization principles. Through rigorous methodologies encompassing data validation, decentralized access control, and scalable transaction mechanisms, the BBKR demonstrates efficacy in upholding data integrity, enhancing scalability, and fortifying security provisions. Empirical evaluations underscore its transformative potential in revolutionizing AIML data management paradigms, offering a robust foundation for further advancements in the field.

Keywords Blockchain · Blockchain-based knowledge repository (BBKR) · Artificial intelligence and machine learning (AIML) · Training data · Data

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integrity · Security · Decentralization · Ethereum · Smart contracts · Financial literacy

1 Introduction

In the rapidly evolving landscape of Artificial Intelligence and Machine Learning (AIML), the necessity for robust data governance mechanisms has become increasingly apparent. Traditional centralized data repositories, prevalent in conventional practices, pose significant challenges such as vulnerability to breaches and manipulations, as well as limitations in scalability. These centralized systems raise concerns regarding data ownership, transparency, and accountability as control over data remains concentrated within a few entities.

This research presents a novel solution—the Blockchain-Based Knowledge Repository (BBKR)—to address the drawbacks of centralized data repositories. In essence, BBKR creates a decentralized framework for AIML data governance by utilizing the disruptive potential of blockchain technology. BBKR seeks to transform the AIML space by utilizing the immutable ledger and smart contract features of blockchain technology.

The core of BBKR is its ability to reinvent security and integrity of data by utilizing blockchain technology. Because blockchain is decentralized, it guarantees immutability and resistance to manipulation, unlike traditional centralized archives that are vulnerable to compromise. Every data input in BBKR is hashed and given a unique Universal Unique Identifier (UUID) to ensure its validity and integrity [1].

BBKR uses a multipronged approach to tackle several aspects of data governance. Every component, from validation and storage to scaling and access control, is painstakingly created to maintain the greatest levels of data security and integrity. Decentralized access control systems strengthen security protections against malevolent manipulation and unauthorized access while endowing users with ownership rights.

Because BBKR understands that efficiency and scalability are critical for AIML data governance, it includes a two-phase transaction mechanism. This technique ensures smooth scalability to meet increasing demands while optimizing transaction throughput, enabling real-time data processing. The usefulness of BBKR in improving scalability, fortifying security measures, and maintaining data integrity in a variety of AIML applications has been verified by empirical assessments [2].

In summary, the Blockchain-Based Knowledge Repository (BBKR) stands at the forefront of revolutionizing AIML data management practices. By leveraging blockchain's inherent characteristics, BBKR addresses the shortcomings of centralized data repositories, offering a decentralized solution that prioritizes data integrity, security, and scalability. With its multifaceted approach and empirical validation, BBKR holds immense potential in shaping the future of AIML data governance, paving the way for enhanced innovation and trust in artificial intelligence technologies.

2 Literature Review

The study article addresses contemporary methods for protecting corporate databases from attacks. Given the extensive use of database systems and the requirement to safeguard data from both internal and external threats, it highlights the growing significance of database security. The paper describes the availability, confidentiality, and integrity of databases along with workable ways to enforce them. It also outlines typical database attacks, including SQL injection and privilege abuse, and the countermeasures that go along with them, like query-level access control. The study concludes by highlighting the necessity of customized security solutions based on risk analyses for various database types and the significance of data models in promoting accuracy and efficient communication [3].

The study explores the difficulty of forecasting replicated database performance, which is essential for their successful use in practical applications. It offers a fresh strategy that is based on the application of analytical models. These models use workload characteristics derived from measurements taken from a stand-alone database system. The models are fed with extracted parameters, such as the ratio of read-only to update transactions, abort rates, and resource needs. Most importantly, the models take into account the overheads related to update propagation and possible conflicts in settings that are repeated. This makes it possible to forecast important performance parameters, such as throughput and response time, before the replicated system is put into service. This research is extremely relevant to the task of conducting a thorough literature review on blockchain-based knowledge repositories for AI model training because it provides valuable insights for capacity planning and resource allocation optimization. Specifically, the ability to predict how a database solution will scale under various workloads is crucial [4].

The issue of security flaws in the database management systems used by public organizations is examined in this research article by Toapanta et al. "Analysis for the Evaluation and Security Management of a Database in a Public Organization to Mitigate Cyber Attacks." These weaknesses make these kinds of businesses vulnerable to cyberattacks. The authors offer a unique security approach built on a hybrid blockchain model in order to combat this. They show their management system's logical structure, a database security algorithm, an architecture for blockchain-based security management, and prototypes for assessing database security. The suggested model's potential efficacy is demonstrated by simulations, which yield a security rating of up to 99.50%. This suggests that this strategy has the potential to greatly improve the security of databases in government agency [5].

The analysis of different hybrid blockchain database systems' performances is the main goal of this research work. These systems combine the immutability and security features of blockchain technology with the advantages of distributed databases. Veritas (Kafka), Veritas (Tendermint), BlockchainDB, BigchainDB, and BigchainDB (PV) are the five major systems that are examined in this article. One important discovery is that systems constructed on Byzantine Fault Tolerant (BFT) consensus, which is common in blockchains, perform noticeably worse than those

employing Crash Fault Tolerant (CFT) consensus, like Veritas (Kafka). The trade-off between security and efficiency when creating such systems is shown by this performance disparity. The analysis also reveals design factors such the complexity added by BFT methods in systems like Veritas (Tendermint) and storage overhead, which is larger in BlockchainDB. In the end, this article provides insightful advice for developers looking to put hybrid blockchain database systems into practice, highlighting the necessity of carefully balancing the demands of storage, security, and performance for their particular applications [6].

The subject of blockchain technology and artificial intelligence (AI) integration is one that is evolving quickly and has the potential to drastically change a number of industries. Taherdoost [2] provides a thorough critical analysis that highlights the practical uses of this integrated strategy. A safe basis for data exchange and transaction management is provided by the immutability and decentralized nature of blockchain technology. AI also adds sophisticated analytical and decision-making abilities, which improves processes even further inside complicated systems. The examined literature shows effective use examples in a variety of industries, including supply chain management, healthcare, and finance, highlighting how blockchain technology and artificial intelligence work together to solve problems with automation, transparency, and data protection. Taherdoost's analysis does, however, also draw attention to lingering issues, such as scalability and the requirement for additional integrated system optimization. These constraints act as a guide for further investigation, inspiring the hunt for fresh approaches to optimize the revolutionary potential of blockchain and AI [7].

Artificial intelligence (AI) and blockchain technology integration is becoming a major area of study for supply chain researchers. The ability of these technologies to handle fundamental issues like security, effectiveness, and resilience in intricate and unstable corporate environments is what people interested. The distributed ledger technology of blockchain provides a safe means of monitoring data and transactions, while artificial intelligence's analytical powers can reduce costs, expedite delivery procedures, and improve product traceability from manufacturer to customer. Research already conducted shows supply chains might benefit conceptually and practically from the integration of blockchain and artificial intelligence. A critical examination, however, emphasizes the necessity of ongoing innovation. Future research has to concentrate on getting past obstacles and realizing the full potential of this explosive combination in the dynamic field of supply chain management [7].

The integration of Artificial Intelligence (AI) and blockchain holds immense potential for transforming businesses in the era of the Fourth Industrial Revolution. Despite existing research on both technologies, there's less clarity on how they can be strategically combined for specific business use cases. This study seeks to fill this knowledge gap through a bibliometric-content analysis of existing research on AI-blockchain integration for business. The bibliometric analysis identifies the most impactful papers, while the content analysis reveals the key themes and promising application areas within this field. The research highlights significant potential across industries, including supply chain optimization, secure healthcare data management,

trustworthy financial transactions, and streamlined finance and accounting processes. By offering a clearer understanding of how AI and blockchain can be leveraged together, this study provides valuable insights for researchers and businesses looking to explore the benefits and real-world applications of this technological convergence [8].

3 Methodology

The methodology adopted in this research endeavours to develop and assess a Blockchain-Based Knowledge Repository (BBKR) tailored for the storage and governance of training data pertinent to Artificial Intelligence and Machine Learning (AIML) models. The system harnesses the Ethereum blockchain platform and smart contracts to uphold data integrity, fortify security measures, and propagate decentralization principles.

3.1 Data Storage and Validation

The BBKR leverages a smart contract deployed on the Ethereum blockchain to orchestrate the management of training data. Each data entry undergoes assignment of a Universal Unique Identifier (UUID) upon registration, facilitating streamlined retrieval processes. To fortify data integrity, a hashing mechanism is employed for the computation and preservation of hash values corresponding to the training data. These hash values are concomitantly stored on the blockchain alongside the data entries. During data retrieval instances, the system conducts recalculations of the hash values of the retrieved data, juxtaposing them against the stored hash values to ascertain data authenticity and integrity.

3.2 Decentralization and Access Control

Exploiting the inherent decentralized attributes of blockchain technology, the BBKR obviates the exigency for a centralized repository, thereby fostering transparency and endowing users with ownership rights over their data. Intricate access control protocols are ingrained within the smart contract infrastructure, affording stringent restrictions on data access and modification privileges, thereby fortifying security provisions.

3.3 Scalability and Efficiency

To mitigate plausible scalability constraints, the system delves into a bifurcated transactional mechanism, demarcating request and response transactions to facilitate real-time processing. This bifurcated approach endeavors to optimize transactional throughput, thereby fostering efficacious data management, particularly in the context of voluminous datasets.

3.3.1. Data Preprocessing and Standardization: Before being registered within the BBKR, data might undergo preprocessing and standardization procedures to ensure quality and consistency. This could incorporate:
3.3.2. Normalization/Scaling: To improve model convergence and mitigate the influence of feature disparities.
3.3.3. Data Cleaning: Addressing issues like missing values, outliers, or inconsistencies.
3.3.4. Format Standardization: Enforcing common data formats (e.g., CSV, JSON) to streamline integration with AIML pipelines.
3.3.5. Version Control and Provenance Tracking: Tomaintain historical records and facilitate reproducibility, the BBKR could implement:
3.3.6. Automatic Versioning: Assigning version identifiers to data entries whenever updates occur.
3.3.7. Provenance Metadata: Recording information about the data origin, transformations applied, and its usage history on the blockchain.

3.4 Incentivization Mechanisms: To Encourage Participation and Data Sharing, Consider Exploring

3.4.1 Reputation Systems: Where users who contribute high-quality data earn reputation scores that translate into privileges or benefits.
3.4.2 Token-Based Models: Potentially incorporating a token system to reward data providers or to manage access rights within the BBKR ecosystem.

4 Results

The evaluation of the BBKR is underpinned by a multipronged approach aimed at gauging its efficacy and feasibility in the management of AIML training data.

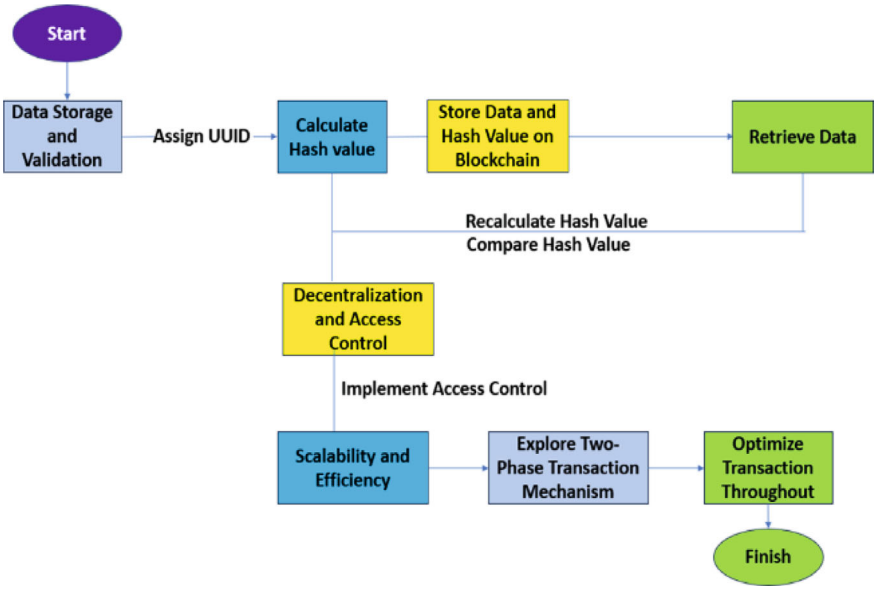


Fig. 1 Working mechanism of BBKR in artificial intelligence and machine learning

4.1 Security and Data Integrity

Rigorous penetration testing endeavours and exhaustive security audits are conducted to gauge the system's resilience against data tampering endeavors and unauthorized access incursions. The efficacy of the hash-based validation mechanism in upholding data integrity is scrutinized through comprehensive testing and validation protocols.

4.2 Performance and Scalability

The temporal requisites for data registration, retrieval, and modification operations on the blockchain are quantified and juxtaposed against benchmarks set by conventional methodologies. The system's aptitude to accommodate extensive datasets and frequent data modifications is appraised, with a specific emphasis on scalability and transactional throughput evaluations (Fig. 1).

4.3 Cost-Effectiveness

The gas costs entailed in interactions with the smart contract infrastructure on the Ethereum blockchain are dissected to ascertain the system's cost-effectiveness

quotient. Strategies aimed at ameliorating transactional costs and augmenting overall cost efficiency are explored to fortify the system's practicality and affordability credentials.

4.4 Inference and Training Efficiency

The ramifications of a committee-based paradigm for inference and training on model performance metrics and training tempo are evaluated and juxtaposed against centralized counterparts. The BBKR's efficacy in facilitating collaborative training and inference exercises is scrutinized to elucidate its suitability for AIML model development endeavors.

5 Future Scope

The development of the Blockchain-Based Knowledge Repository (BBKR) marks a promising step towards secure and decentralized AIML data governance. Further research and innovation hold the potential to unlock even greater advancements:

5.1 Optimization and Advanced Cryptography

Although Ethereum offers a strong base, investigating other blockchains designed specifically for data storage could reduce transaction costs and increase transaction efficiency [9, 10]. Investigating state-of-the-art cryptographic methods such as homomorphic encryption, zero-knowledge proofs, and safe multi-party computation will greatly improve privacy and allow computation on encrypted data without sacrificing security [11, 12].

5.2 Integration with Differential Privacy and Federated Learning

Combining the BBKR with frameworks for federated learning would enable decentralized model training among dispersed nodes while protecting the privacy of data. Differential privacy strategies would provide for more control over data disclosure and further protection of sensitive information, allowing for collaborative AI development without jeopardizing individual privacy.

5.3 Multi-chain Contexts and Interoperability

The BBKR's scalability and versatility would be significantly increased by looking into how it operates in multi-chain contexts. The BBKR's range of applications would be substantially increased if research on cross-chain communication protocols allowed it to easily interface with blockchains devoted to identity management, data provenance, or specialized AI algorithms [13, 14].

5.4 Legislative and Ethical Frameworks for Implementing BBKR and Decentralized AIML Systems

Comprehensive legislative and ethical frameworks are essential for the proper implementation of the BBKR, in addition to technological improvements [15]. Future studies on decentralized AIML systems should focus on data ownership, informed consent, accountability, and openness. By establishing best practices and standards, we can make sure that the application of this technology is consistent with ethical AI concepts and societal norms.

5.5 Real-World Applications and Impact Assessment

Applying the BBKR to a variety of real-world use scenarios will reveal important details about its applicability and areas in need of improvement [6, 16, 17, 19, 20]. Future deployment strategies would benefit from case studies in sectors where data integrity, security, and traceability are critical, such as supply chain management, healthcare, and finance. These studies would provide useful benchmarks.

5.6 AI-Driven BBKR Optimization

Using AI methods to improve the BBKR itself is an interesting direction to pursue. AI systems could suggest the best blockchain setups, proactively identify security problems, and evaluate data usage trends to develop clever data sharing schemes [8, 11, 19, 21]. Over time, this self-optimizing strategy would greatly improve the BBKR's performance and resilience.

By pursuing these avenues of research, the BBKR can evolve into a cornerstone for secure, ethical, and transformative AI development across various sectors and applications.

6 Conclusion

The instantiation of the blockchain-based knowledge repository elucidates its transformative potential in revolutionizing the paradigm underpinning the storage and governance of training data germane to AI and ML models. By harnessing the disruptive potential of blockchain technology, the system espouses data integrity, security, and decentralization imperatives, thereby surmounting quintessential challenges posed by extant data storage methodologies. The outcomes of empirical evaluations underscore the efficacy and efficiency of the proposed approach, thereby laying a robust foundation for further strides in the AIML.

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Cybercrime Threats to Economic and Social Security: An Analytical Study



Omar Al Makhzoumi and Abeer Zohair Said Saada

Abstract The focus of this chapter is cybercrime, specifically examining the impact of cyber terrorism and electronic money laundering on cybersecurity and financial systems. The study delves into the associated risks and threats, while also evaluating the effectiveness of current legal and regulatory measures in addressing these challenges presented by technological advancements. Several objectives are set forth, such as analyzing the threats posed by cyber terrorism and money laundering, assessing existing legal mechanisms, and providing recommendations to enhance responses to these threats. Through a descriptive-analytical approach, data from various sources, including previous studies and current legislation, was collected and analyzed. The findings highlighted deficiencies within current legal frameworks and demonstrated the complexities introduced by technological progress. Key recommendations include strengthening international collaboration, developing protective technologies, and promoting awareness and training to effectively combat cyber terrorism and electronic money laundering.

Keywords Electronic money laundering · Cybersecurity · Legal mechanisms · Cybercrime · Threats · Risks · International cooperation

1 Introduction

The advent of communication technologies and the Internet has given rise to novel forms of criminal activity that pose a significant threat to societies, relying heavily on technology rather than physical actions. Consequently, new means of perpetrating crimes that jeopardize the security and economic stability of communities have emerged, including cyber terrorism and electronic money laundering.

One cannot overlook the fact that the field of cybersecurity is confronted with major hurdles in the form of cyber terrorism and electronic money laundering. The

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modern era witnesses a rise in the intricacy and variety of cyberattacks, posing a pressing need for effective countermeasures. Simultaneously, it is imperative to address the issue of electronic money laundering in order to bolster financial integrity and promote transparency in monetary transactions, thereby contributing to the stability of the global financial system [1].

With reference to the aforementioned, the objective of this research is to shed light on the various aspects of cyber terrorism and electronic money laundering, while comprehending the consequences they impose on both individuals and institutions.

1.1 Study Objectives

- Define the concept of cyberterrorism and the methods used in cyberattacks.
- Analyze techniques used in cyberattacks such as viruses, worms, attacks on infrastructure, the creation of terrorist websites, and the use of email.
- Assess national and international legislation related to cyberterrorism.
- Define electronic money laundering, how it is carried out on the Internet and analyze the legal regulations regarding electronic money laundering.

1.2 Methodology

A comprehensive analysis of cyber terrorism and electronic money laundering threats and risks is conducted in this study using a descriptive approach. The methodology employed aims to thoroughly describe and analyze the current phenomena by collecting and interpreting data.

2 Cyber Terrorism Using Electronic Means

The emergence of cyber terrorism can be traced back to the widespread dissemination of the “I LOVE YOU” computer virus in 2000, which resulted in an estimated ten billion US dollars worth of damage to information and data. The Federal Bureau of Investigation (FBI) established a connection between cybercrimes and the September 11 attacks, prompting the signing of the Convention on Cybercrime in Budapest, Hungary, by thirty nations. This historic agreement, signed in 2001, marked the first international effort to address cybercrime. A notable incident occurred in 2003 when the “Blaster” virus infected and destroyed approximately half a million computers, resulting in repair costs of around 12 billion dollars, as reported by the Council of Europe during the international convention on combating cybercrime. Consequently, this section of the text aims to provide an overview of cyber terrorism, its various manifestations, and the methods employed through electronic means.

2.1 Concept of Cyber Terrorism Using Electronic Means

Cyber terrorism, although rooted in the same definition as traditional terrorism, distinguishes itself through the utilization of distinct tools to accomplish its objectives. Extremists leverage the internet to disseminate their harmful ideologies and teachings, instructing individuals on the creation of explosives, hacking email accounts, sabotaging websites, and spreading viruses. This is made possible through the implementation of advanced communication technology and society's increasing reliance on it [2].

The act of cyber terrorism involves the utilization of contemporary digital technologies by individuals, groups, or states to target information systems in order to instill fear and exert control over others for religious, ethnic, or political purposes [3]. According to the U.S. Department of Justice, cyber terrorism encompasses any criminal activity where the offender possesses the necessary knowledge and intent to carry out the act [4].

In Article 147 of the Penal Code, the Jordanian legislator provides a comprehensive definition of terrorism. According to this definition, terrorism involves the use of violence or the threat of violence, regardless of the motives or purposes behind it. The aim of terrorism is to carry out a criminal project, whether on an individual or collective level, with the intention of endangering the safety and security of the community. This includes causing terror and fear among people, putting their lives at risk, causing harm to the environment, public or private property, international facilities, or diplomatic missions, as well as coercing international or regional organizations into specific actions or refraining from them. In contrast, cyber terrorism refers to acts of intimidation, aggression, or threats against individuals in various aspects of their lives, such as their person, religion, property, or intellect. These acts are carried out through the use of informational and electronic resources, as well as through different forms of corruption and aggression.

Unlike traditional terrorism, cyber terrorism has not been specifically defined by the Jordanian legislator. However, Article 2 of the Anti-Terrorism Law No. 55 of 2006 provides a definition of terrorism as: "any deliberate action carried out through any medium." According to this definition, the Jordanian legislator's concept of terrorism includes the following [5]:

1. **Criminal Intent**: The act must be intentional; the absence of criminal intent does not elevate it to the level of cyber terrorism.
2. **By Any Means**: This means that modern digital technological means, such as computers, associated software, and the internet, fall under the terrorist acts intended by the Jordanian legislator.
3. **Causes Harm**: In order to disrupt public order, endanger community safety and security, or interfere with the implementation of the constitution or laws, influence state policy or government actions, or disrupt national security through intimidation, coercion, or violence, an act must result in the death of a person, physical injury, or damage to public or private property, transportation, the environment, infrastructure, or international organizations or diplomatic missions.

3 Electronic Money Laundering

The concept of "money laundering" has a long history, with its origins dating back to the infamous "Al Capone" case in 1931. Al Capone, a prominent figure in the mafia, engaged in tax evasion, prompting the mafia to utilize their networks to acquire and establish lawful enterprises as a means to legitimize the proceeds from their illicit operations. A notable instance occurred in the United States in 1988, when significant sums of money derived from Colombian cocaine trafficking were confiscated [6].

Over time, techniques for money laundering have progressed and become increasingly advanced, utilizing contemporary methods and strategies to hide the origin of illegal funds. Alternative expressions for money laundering, such as "cleaning money," "whitening money," and "refining money," all share the same objective.

3.1 Concept of Electronic Money Laundering

The act of electronic money laundering can be described as the process of carrying out financial transactions over the internet in order to hide the origin of illegal funds and make them appear legal. Popular techniques for this illicit activity involve conducting online transfers, utilizing internet banks as a means to protect laundered money, and engaging in e-commerce investments [6].

Money laundering, as defined by Article 2 of the Anti-Money Laundering and Counter-Terrorism Financing Law No. 46 of 2007, encompasses various actions aimed at concealing or disguising the illicit source, nature, whereabouts, movement, or ownership of funds. These actions include acquiring, possessing, managing, transferring, or manipulating funds. The primary objective is to prevent the identification of the individuals responsible for the underlying criminal activities that generated the funds. It is important to note that this definition applies to all offenses specified in Article 4 of the Jordanian Anti-Money Laundering and Counter-Terrorism Financing Law No. 46 of 2007, along with its subsequent amendments [5].

In accordance with Article 1(b) of Law No. 80 of 2002, the Egyptian legislator has provided a comprehensive definition of money laundering. This definition encompasses various actions such as the acquisition, possession, management, and manipulation of funds that originate from criminal activities listed in Article 2 of the same law. The primary objective of these actions is to conceal or disguise the true nature, source, location, ownership, or rights associated with the funds. Additionally, the intention behind money laundering is to impede the detection or hinder the identification of the individual responsible for the initial criminal act that generated the funds [7].

Upon examining the definitions associated with electronic money laundering, it becomes evident that although various linguistic expressions are employed to describe this offense, there are fundamental and shared elements that all definitions concur upon, which are as follows [8]:

1. **Aims to Invest in Illicit Funds**: The primary objective is to invest money that is obtained through illegal means.
2. **Multiple Beneficiaries and Interveners**: There are often multiple parties involved in or benefiting from the laundering process.
3. **Often Transnational Crime**: Money laundering is frequently considered a transnational crime, crossing international borders.
4. **Use of Various Methods and Creative Tactics**: Perpetrators employ numerous techniques and are known for their ingenuity and scheming skills.
5. **Exploitation of Weak Regulatory and Supervisory Countries**: The crime often exploits countries with weak regulations and enforcement measures to combat it.

3.2 Characteristics of Electronic Money Laundering

From the previous discussion of electronic money laundering, it is evident that this crime has several distinct characteristics, which are as follows [9]:

- **Organized Crime**: The act of electronic money laundering is classified as a form of organized crime, as it necessitates the presence of multiple components to establish its foundation. It relies on a group of skilled individuals who are unafraid and unwavering when faced with potential risks, employing cutting-edge technological techniques to guarantee the triumph of their illicit endeavors [9].
- **Economic Crime**: The act of money laundering presents a substantial threat to societies on both a local and global scale. It hinders the progression of investments, disrupts the stability of the investment environment, and influences inflation rates as funds are redirected towards consumption by disorganized and irrational groups, resulting in heightened prices [10].
- **International Nature**: The rise of globalization and the worldwide emphasis on transactions, trade, and information exchange have paved the way for organized crime to flourish through cross-border fund movement. Exploiting the lack of stringent punishments and regulatory oversight in certain countries, criminal organizations have taken advantage of this scenario, making it a daunting task to establish global legislation [11].
- **Use of Modern Technology**: The inclusion of the internet in money laundering activities has been facilitated by the merging of computer networks with financial transactions, e-commerce solutions, and electronic transfer systems. This merging poses challenges in terms of gathering evidence and prosecuting criminals, as it necessitates the involvement of experts with specialized technical knowledge, and digital files and systems can be effortlessly moved [12].

Additionally, the characteristics of electronic money laundering consist of three main elements [13]:

1. **Dirty Money**: To ensure the concealment of illicit funds, it is necessary to transform them into seemingly legitimate assets that are devoid of any suspicion of illegality and give the impression of having been obtained through lawful channels.
2. **Activities to Conceal Dirty Money**: The activities used to hide the illicit funds, blending them with money generated from these fraudulent activities.
3. **Parties Involved in the Laundering Process**: The individuals or entities responsible for carrying out the laundering operations, creating a fictitious story to regenerate the new, clean appearance of the money.

3.3 Methods of Electronic Money Laundering

The methods of electronic money laundering are as follows:

1. **The Structuring Method**: To execute this technique, the strategy entails fragmenting substantial sums into smaller increments that do not surpass ten thousand dollars. This is accomplished through the collaboration of multiple reliable individuals who deposit these amounts into different banks. Depending on the nature of the illicit activity, the deposits may be consolidated into a single bank account. For example, in instances of tax evasion and embezzlement, the funds are amassed in a designated bank account before being electronically transferred abroad.
2. **The Misleading Method**: This method involves creating front companies, such as travel agencies, to mix the company's revenues with drug revenues, making them appear legitimate.
3. **The Collusion Method**: This involves bank employees assisting money launderers by facilitating large cash deposits, often in exchange for a percentage agreed upon, which can be up to 20%.
4. **The Transportation Method**: There are two approaches employed in this process: The initial method involves the physical movement of cash and goods using ships and planes, especially in situations where depositing them becomes challenging due to strict bank reporting systems or a lack of confidentiality. The second approach entails electronic transfers, which are deemed the swiftest and riskiest form of money laundering, yet also the most secure and elusive to uncover. It usually involves electronic transfer systems such as:

    a. FedWire System: Managed by the Federal Reserve Bank.
    b. CHIPS System: A European system based in Belgium.
    c. SWIFT System: Managed by the SWIFT organization.

5. **The Layering Method**: To conceal the origin of funds, this approach relies on intricate financial transfers, which involve multiple electronic transfers between banks, as well as the conversion of money into travel agencies and treasury bonds, thereby adding layers of complexity and evading suspicion and scrutiny.

6. **The Purchase Method**: This method involves purchasing real estate, vehicles, apartments, goods, and insurance policies, which are then resold.
7. **The Mixing Method**: This method uses accounts held by accountants, lawyers, financial advisors, and other individuals not suspected of wrongdoing.
8. **The Concealment Method**: To achieve anonymity for the recipient or depositor, a method employed is the utilization of credit and debit cards, with the added measure of conducting transactions from various locations. The internet serves as a tool, employed by banking institutions, travel agencies, intermediaries, and corporations, to create an illusion of legitimacy and obfuscate the origin of the monetary resources.
9. **The Foreign Currency Mixing Method**: The approach utilized in this process takes advantage of or convinces entrepreneurs who desire to bring in merchandise to buy foreign currencies in order to fund their imports. The arrangement entails providing drug dollars acquired within the country of importation and receiving domestic currency in return.
10. **The Borrowing Method**: By utilizing the bank's guarantee, the launderer acquires funds that have been deposited and then proceeds to invest in a project that is recognized by the law. The repayment of these funds, which are used to conceal the act of money laundering, is done through regular installments made by a legal entity.
11. **The Ownership of Financial Instruments Method**: To execute this technique, brokerage firms are utilized to collect untainted funds following the process of money laundering. These firms entice customers with complimentary or affordable brokerage services, subsequently carrying out deceitful transactions involving the sale of bonds or stocks disguised as legitimate securities, thereby consolidating lawful funds.

3.4 Forms of Money Laundering via Electronic Means

The forms of electronic money laundering are diverse and include the following key methods:

1. **Money Laundering via the Internet**: With the global expansion of internet usage, cybercrimes have become increasingly prevalent. Simultaneously, banks have adapted to the digital age, introducing online banking, electronic checks, and internet-based credit card systems. Unfortunately, these advancements have also given rise to online money laundering, a widespread issue that accounts for over 15% of the world's national income. Internet mafias, specializing in cybercrimes such as credit card fraud, have emerged and amassed substantial wealth, reaching hundreds of millions of dollars. Moreover, virtual gambling establishments and entertainment platforms have proliferated, further contributing to the problem. Electronic money laundering crimes often exploit personal information obtained from social media platforms. Additionally, there is a method in which individuals in need of funds seek assistance in transferring money, seemingly willing to pay

for the service. However, once they have obtained the person's banking details, they swiftly empty the account and disappear [14].

2. **Smart Cards**: The banking sector has been revolutionized by the introduction of smart cards, which are considered one of the most important advancements in this field. These cards, made of plastic, are equipped with chips that can store data and provide a wide range of services, including access to personal account information and medical history. With the ability to be pre-loaded with a specific amount of money, smart cards function as portable computers that do not require a connection to the bank's computer system. This means that withdrawals can be made in more than 53 countries without any legal restrictions or the need for approval from the bank, making them an incredibly convenient tool for individuals involved in money laundering [15].
3. **Electronic Money Transfer**: Criminals employ a particular technique wherein they first deposit their illicit funds into legitimate banks before transferring them to shell companies located in countries where such activities are prevalent. By doing so, they ensure their own protection and receive approximately 3% of the total value of the money being laundered. These funds are then utilized to purchase various assets, including but not limited to cocaine and real estate, on a global scale. The crucial aspect of this method lies in the fact that by transferring the money to a jurisdiction outside the reach of law enforcement, the criminals can take advantage of banking secrecy laws, effectively shielding their identities from disclosure or investigation. Subsequently, auditing firms borrow money from banks by utilizing the previously deposited funds as collateral, with the ultimate intention of returning the laundered and purified money back to the criminals [16].
4. **Electronic Money**: The digital equivalent of physical currency, electronic money is seamlessly transferred online without the need for a middleman. It is securely stored on a memory card and can be conveniently accessed using a smart card. With its minimal transaction fees, user-friendly nature, and lack of geographical restrictions or bureaucratic processes, electronic money presents an appealing choice for those involved in illicit financial activities [17].
5. **Internet Banks**: One of the most recent and perilous forms of money laundering involves the use of internet banks. These intermediaries carry out banking operations and provide financial services, but they are not traditional banks that accept deposits. To transfer funds, users input a confidential code into a computer, making this method an ideal choice for securely and effortlessly laundering substantial sums of money [18].
6. **ATM Machines**: To evade the scrutiny of conventional banking processes that involve investigating client transactions for signs of illicit financial activities, these devices are employed to facilitate the deposit and withdrawal of illicit funds. This technique offers a secure refuge for individuals involved in money laundering. A notable incident occurred in 2007 when individuals in the United States were discovered using ATMs to launder drug money originating from Colombia. They enlisted the help of their acquaintances and family members to open bank accounts, deposit the funds, obtain two cards per account, and

subsequently transfer the money to Colombia, where it was then withdrawn from ATMs [19].

3.5 Forms of Criminal Participation in Electronic Money Laundering

The rise of electronic money laundering as a contemporary criminal activity can be attributed to the advancements in information technology. This has given rise to novel methods of committing the crime, utilizing modern electronic platforms and information systems. As a result, the existing legal framework has become insufficient in addressing this evolving nature of the crime. Therefore, the need for new laws and regulations that are in line with the modern landscape has become imperative. In the following discussion, we will explore the legislative foundation of this offense and examine the various ways in which individuals engage in criminal activity within this realm.

Legislative Basis for Electronic Money Laundering

The act of electronic money laundering is classified as an ongoing offense that necessitates a harmonization of understanding regarding its illicit origins and the criminal actions involved. Typically, knowledge follows the criminal behavior, especially when it comes to the movement or transfer of funds, which tends to be a short-term activity, rendering money laundering a temporary offense. As a result, it becomes imperative to synchronize knowledge and behavior. Furthermore, money laundering is a deliberate crime that requires both a general intent and a specific intent. This implies that the perpetrator must have the intention to conceal or alter the nature, source, location, or lawful owner of the funds, as well as impede any attempts to uncover the crime or identify the individual responsible.

Money transfers are the focus of Article 7 in the Electronic Crimes Law No. 27 of 2015. This article stipulates that individuals who engage in any of the actions outlined in Articles 3, 4, 5, and 6 of this law, specifically when conducted on platforms such as information systems, electronic sites, or information networks associated with money transfers, payment services, clearing, settlements, or any banking services provided by banks and financial institutions, will face penalties. These penalties involve a minimum of five years of temporary hard labor and a fine ranging from 5000 JDs to 15,000 JDs.

One might naturally associate the concept of money laundering with illegal money transfers. However, Article 7 of the Electronic Crimes Law in Jordan does not directly and explicitly pertain to money laundering through electronic methods. Instead, it focuses on other unlawful activities outlined in Articles 3, 4, 5, and 6. The specific offense targeted by Article 7 involves actions committed on information systems, electronic sites, or networks that are connected to money transfers and electronic banking services in a general sense. If the intention of the legislator was to explicitly address money laundering through electronic means, they would have provided a

clear definition of the crime and its components, similar to what the Omani legislator did in Article 21 of the Omani Law on Combating Information Technology Crimes No. 12 of 2011. This particular article penalizes individuals who utilize information networks or technology to transfer illicit funds, acquire, conceal, or disguise their origin, or aid in money laundering activities. While the Jordanian legislator has not directly tackled money laundering via electronic methods, they have criminalized specific actions relating to information systems and electronic banking services [20].

Criminal Participation in Electronic Money Laundering

According to Article 30 of the Anti-Money Laundering and Terrorist Financing Law No. 20 of 2021 and its application to electronic money laundering, the following forms of participation can be identified:

1. **Assisting in Transfer Operations**: The act of facilitating the movement of funds obtained through criminal activity, whether directly or indirectly, is a key aspect of this process. This can involve actions such as emptying an account upon request and transferring the funds to another account, which may be in the name of either the beneficiary or the person initiating the transfer. To accomplish this, two accounts are needed, and the transfer takes place through various means such as information systems, electronic platforms, or networks associated with money transfers or banking services. Electronic transfers have become increasingly popular due to their flexibility and ability to maintain confidentiality [21]. A global phenomenon known as "front companies" has emerged, which are essentially hidden entities that operate without a legitimate business purpose and primarily engage in the laundering of funds from illegal sources. These companies are adept at concealing their activities, making it challenging for governments and jurisdictions to uncover their secret documents and expose their illicit operations [22].
2. **Assisting in Concealment**: The possession of money or proceeds obtained through criminal activities, whether done privately or publicly, is the essence of this particular form. The Sixth International Conference on Criminal Law proposes that the punishment for economic crimes should encompass all types of criminal involvement and apply criminal penalties to legal entities, as stated in their third (a) recommendation. This recommendation emphasizes the inclusion of legal entities and individuals responsible for the actions committed by others, particularly in cases of economic crimes like money laundering [23]. Concealing acts can be carried out by anyone, regardless of their direct involvement in the crime, as long as they aid in its concealment or hinder its detection through information systems, electronic platforms, or networks associated with money transfers and banking services. The law specifically targets those who assist in hiding assets such as equipment, vehicles, yachts, jewelry, or any other assets purchased using money obtained from illegal activities like drug trade or other felonies. It also encompasses funds acquired through the sale of movable assets or other illicit sources. In the case of electronic money laundering, there must be a tangible connection between the actions taken online and the resulting criminal

outcome, where internet activities contribute to the concealment of illegal funds [24].

3. **Incitement to Electronic Money Laundering**: The initial stages of money laundering involve encouraging individuals to deposit or transfer large sums of money into financial institutions, engaging in retail activities that serve as intermediaries for laundering drug money, or purchasing high-value items [25]. In Article 14 of Law No. 80 of 2002 on Anti-Money Laundering, the Egyptian legislature establishes penalties for the commission or attempted commission of money laundering, including the forfeiture of seized funds or an additional fine if seizure is not possible. Article 16 of the same law holds legal entities accountable for violations, with the court having the authority to publish the judgment at the entity's expense and potentially suspend its operations for up to one year. The Egyptian legislature also criminalizes participation, cooperation, and conspiracy in money laundering, as outlined in the general provisions of the Egyptian Penal Code [26]. However, upon analyzing Egyptian legislation, it is evident that it primarily addresses traditional money laundering methods and does not sufficiently cover electronic methods as comprehensively as more modern laws. Therefore, it is crucial for the Egyptian legislature to address this issue in order to effectively combat cross-border crimes that employ new and evolving methods [27].

4 Conclusion

To summarize, this research emphasizes the growing dangers posed by cyber terrorism and electronic money laundering to both cybersecurity and the worldwide financial system. Although there are continuous endeavors to establish laws and implement technologies to counter these threats, it is imperative to continually enhance and modernize these measures in order to stay ahead of ever-evolving cybercrime strategies and technological advancements. It is vital to foster international collaboration, create efficient cybersecurity frameworks, and promote awareness and education to effectively combat these risks. By attaining these objectives, we can safeguard individuals and organizations while fortifying the stability of the global financial and security systems.

4.1 Findings

The study has led to the following findings:

- The rapid advancements in technology present challenges for both national and international legislation when it comes to adaptation.
- The complexity of cyber terrorism necessitates legislation that goes beyond what is currently deemed sufficient to effectively combat the threats it poses.

- Sophisticated and intricate techniques are employed in electronic money laundering, encompassing fragmentation, deception, collusion, transfer, layering, purchase, mixing, and concealment
- According to the study, although progress has been made in global efforts to combat money laundering, there remains a necessity for enhanced international collaboration and stricter legislative measures.

4.2 Recommendations

Based on the findings, the study recommends the following:

- Update and develop national and international regulations to keep up with technological advances and new cyberattack methods.
- Strengthen international cooperation in information exchange and coordination in combating cyberterrorism.
- Invest in the development of cybersecurity technologies and countermeasures to protect critical infrastructure from cyberattacks.
- Improve and update e-money laundering rules to effectively address modern money laundering techniques.
- Strengthen educational and training programs for professionals in the field of combating cybercrime and money laundering.

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Network Architecture Report for DVWA Testing Environment on Azure



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Abstract This study presents a comprehensive analysis of a testing environment built on Microsoft Azure for vulnerability assessment of the DVWA (Damn Vulnerable Web Application) platform. The research focuses on the network architecture, which employs three subnets for segmentation and utilizes cloud-based infrastructure to enhance flexibility. Through rigorous examination, the study identifies potential vulnerabilities in network segmentation and proposes strategic recommendations, including the implementation of robust access controls and advanced intrusion detection systems. The findings underscore the critical importance of addressing these vulnerabilities to bolster the overall security posture and mitigate risks of unauthorized access.

Keywords Cloud · Azure · Vulnerability analysis · Network segmentation · Access controls · Intrusion detection systems · Cybersecurity · Testing environment · Technology shocks · Technological progress · Scientific and technological progress

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1 Introduction

This study aims to document the network architecture of a testing environment built on Microsoft Azure. The primary purpose is to utilize the Identify function of the NIST Framework by performing vulnerability analysis on the DVWA platform hosted within this environment. The scope encompasses the network infrastructure, encompassing hardware components on Azure, software systems like DVWA, and the overall network topology [1]. Stakeholders involved include security professionals and application developers seeking to understand the environment for secure testing practices.

2 Network Design

The simulated network consists of a single virtual network within Azure containing three subnets. Each subnet serves a specific purpose and isolates resources by controlling network traffic flow.

- Subnet 1 (10.0.0.0/24): Contains Machine1, Machine4, and Machine5. This subnet represents the internal network segment for critical servers. It houses one Windows machine and two Linux machines.
- Subnet 2 (10.0.1.0/24): Contains Machine2 and Machine6. This subnet represents another internal network segment for a departmental function. It contains one Windows machine and one Linux machine.
- Subnet 3 (10.0.125.0/24): Contains Machine3. This subnet represents a potentially less critical network segment, for a development environment. It houses a single Linux machine.

2.1 Subnet 1 (10.0.0.0/24)

Subnet 1 is a/24 subnet within the Azure virtual network, containing three virtual machines: Machine1, Machine4, and Machine5. This subnet provides basic isolation for these machines from other resources in the network.

Machines in Subnet 1:

2.1.1 Machine1

- Operating System: Ubuntu Server 22.04 LTS
- Resource Group: ACS Project
- Public IP Address: 20.33.53.54 (Accessible from the internet)
- Location: US-East (Zone 1)

- VM Size: Standard B1s (1 vCPU, 1 GiB memory)
- DNS Resolution: Public IP address
- Role: Linux Server.

2.1.2 Machine4

- Operating System: Windows Server 2018
- Resource Group: ACS Project
- Public IP Address: Not Publicly Accessible (Internal network access only)
- Location: US-East (Zone 1)
- VM Size: Standard B1s (1 vCPU, 1 GiB memory)
- DNS Configuration: Not Configured
- Role: Windows Server.

2.1.3 Machine5

1. Operating System: Ubuntu 22.04 LTS
2. Resource Group: ACS Project
3. Public IP Address: Not Publicly Accessible (Internal network access only)
4. Location: US-East (Zone 1)
5. VM Size: Standard F1s (1 vCPU, 2 GiB memory)
6. DNS Configuration: Not Configured
7. Role: Linux Workstation (Fig. 1).

2.2 Subnet 2 (10.0.1.0/24)

Subnet 2 is another/24 subnet within the Azure virtual network, also providing isolation for two virtual machines: Machine2 and Machine6. Similar to Subnet 1, it separates these machines from other resources in the network.

2.2.1 Machine2

- Operating System: Windows Server 2016
- Resource Group: ACS Project
- Public IP Address: 20.51.195.225 (Accessible from the internet)
- Location: US-East (Zone 1)
- VM Size: Standard B1s (1 vCPU, 1 GiB memory)
- DNS Configuration: Not Configured
- Role: Windows Server.

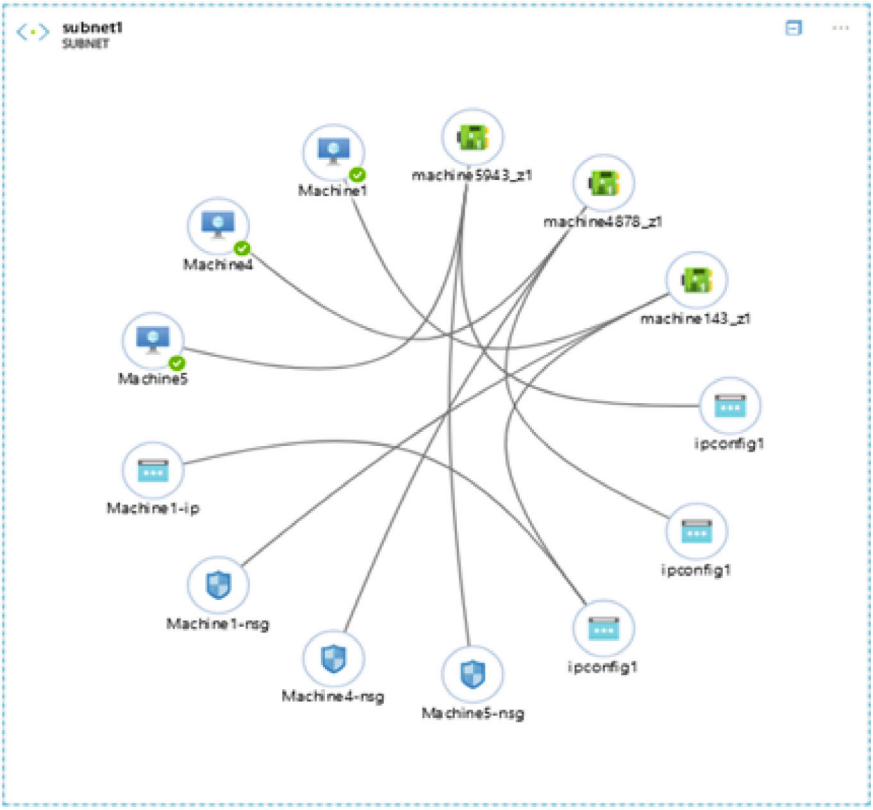


Fig. 1 Network topology diagram for subnet 1

2.2.2 Machine6

- Operating System: Ubuntu 22.04 LTS
- Resource Group: ACS Project
- Public IP Address: Not Publicly Accessible (Internal network access only)
- Location: US-East (Zone 1)
- VM Size: Standard F1s (1 vCPU, 2 GiB memory)
- DNS Configuration: Not Configured
- Role: Linux Workstation (Fig. 2).

2.3 Subnet 3 (10.0.125.0/24)

Subnet 3 is a separate/24 subnet within the Azure virtual network. It contains a single virtual machine, Machine3. This isolated subnet design potentially segregates

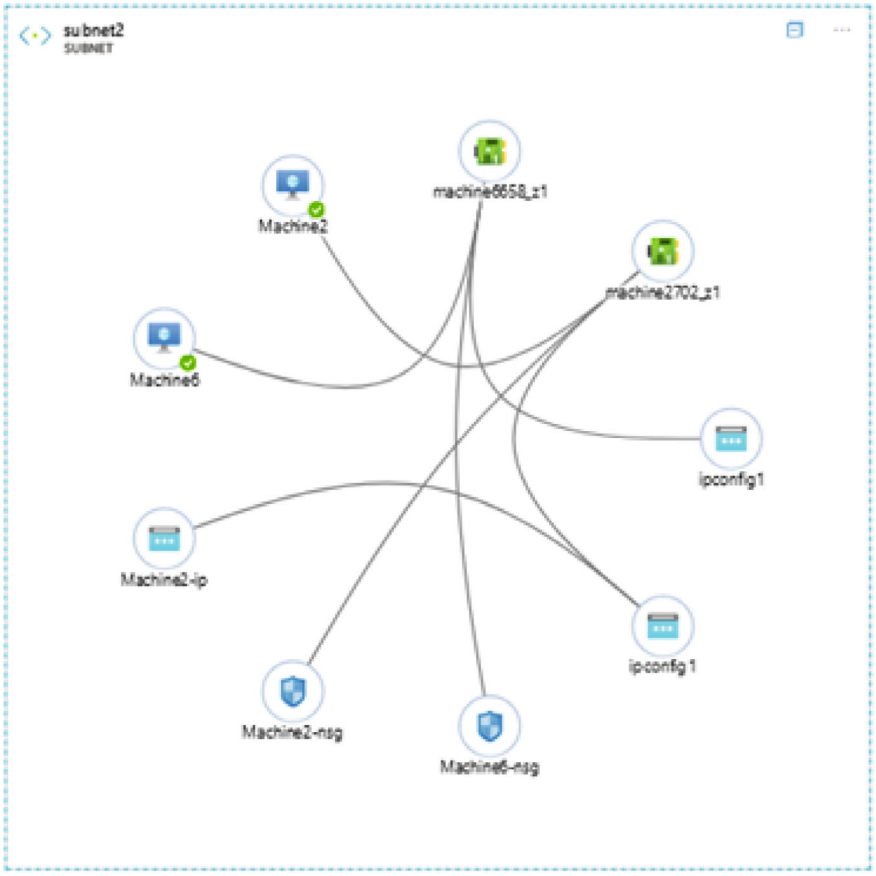


Fig. 2 Network topology diagram for subnet 2

Machine3's traffic from other machines in the environment, which could be useful for specific security purposes.

2.3.1 Machine3

- Operating System: Ubuntu 22.04 LTS
- Resource Group: ACS Project
- Public IP Address: 20.84.77.76
- Location: US-East (Zone 1)
- VM Size: Standard B1s (1 vCPU, 1 GiB memory)
- DNS Configuration: Not Configured
- Role: Linux Workstation (Fig. 3).

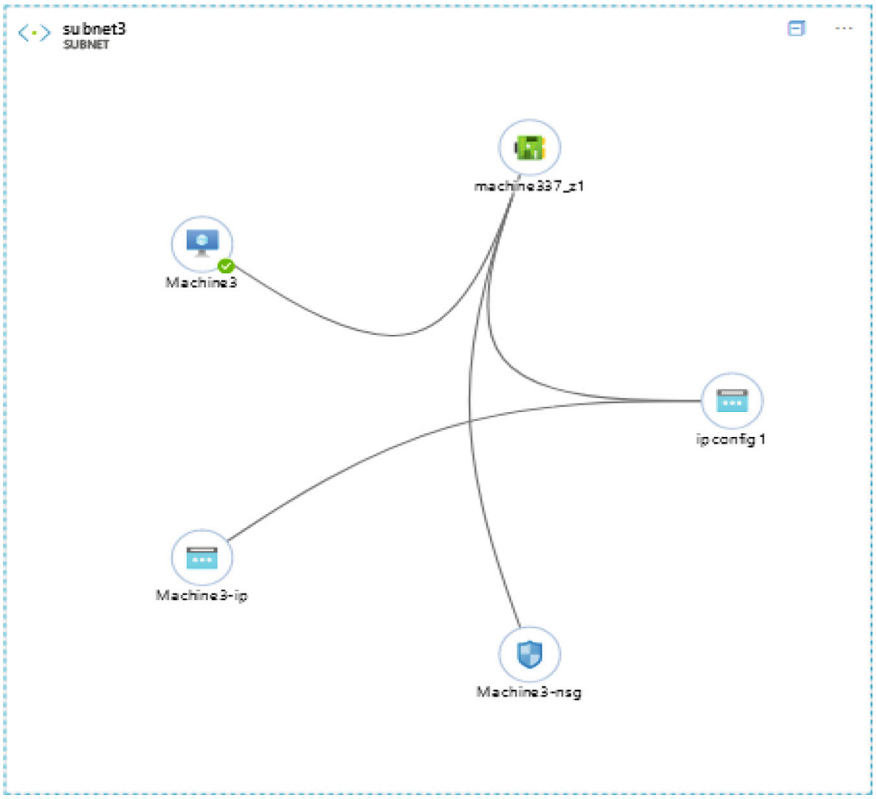


Fig. 3 Network topology diagram for subnet 3

3 Network Configuration Steps

3.1 Resource group creation: a resource group was created in azure to organize all resources associated with the simulated network (Fig. 4).

3.2 Virtual network creation: a virtual network was created within the resource group, specifying the desired address space (CIDR block) to accommodate all subnets (Fig. 5).

3.3 Subnet Creation: Three subnets were created within the virtual network, each with a dedicated address range chosen from the overall virtual network CIDR block. Security considerations like isolation and segmentation influenced subnet creation.

3.4 Virtual Machine Deployment: Multiple virtual machines were deployed within the respective subnets. The deployment process involved selecting the desired operating system (Windows or Linux), choosing VM size based on resource requirements, and configuring storage and network settings. Each VM was

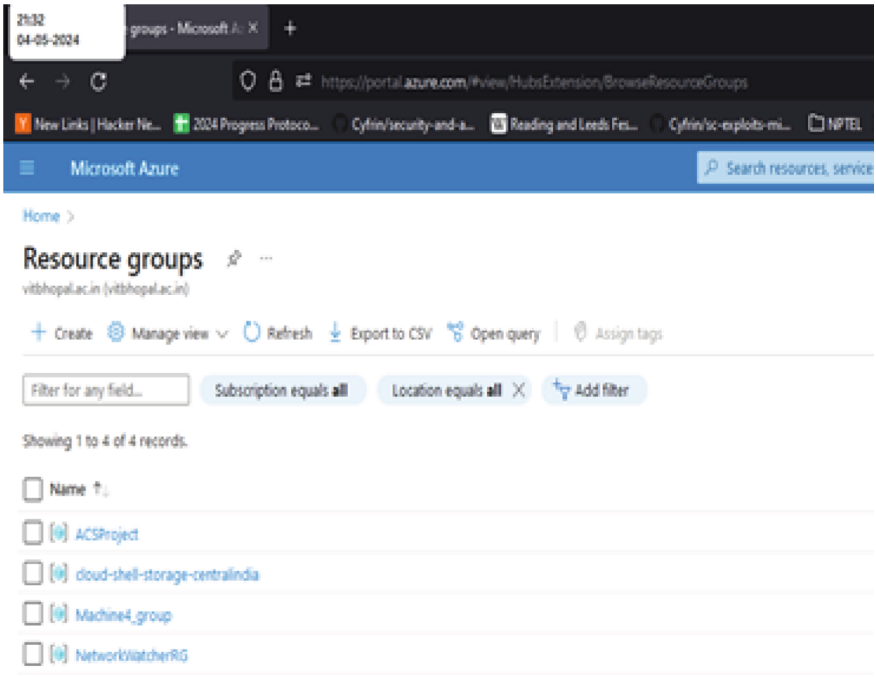


Fig. 4 Network resource groups

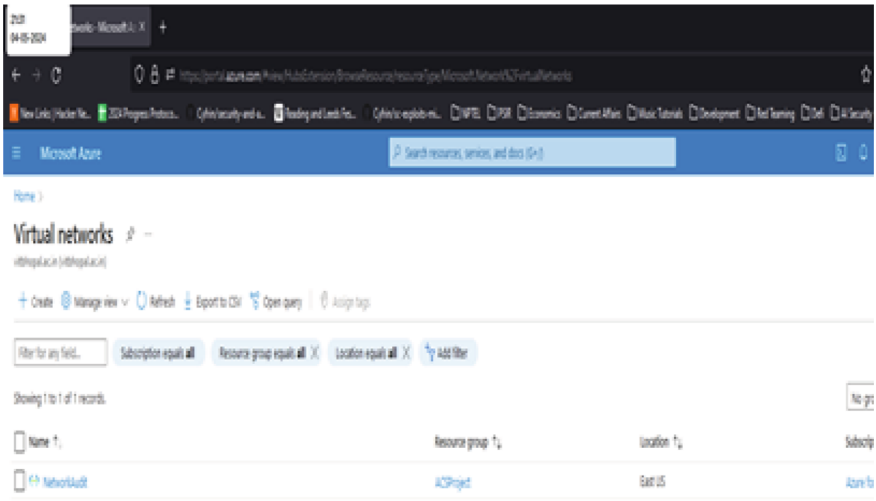


Fig. 5 Virtual networks within azure cloud

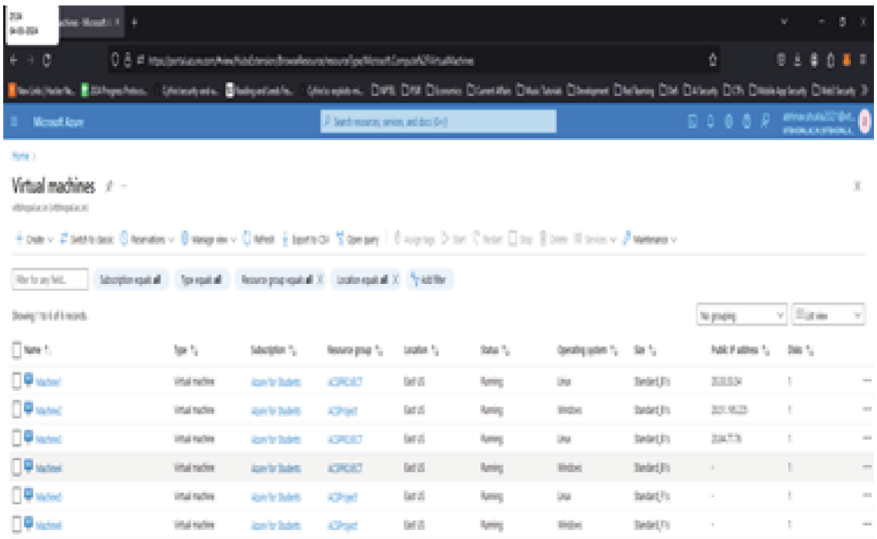


Fig. 6 Deployed virtual machines within virtual network

assigned a unique IP address from the corresponding subnet address pool (Fig. 6).

3.5 Internal Communication: the NSGs were configured to allow communication between VMs within the same subnet, simulating internal network traffic flow.

3.6 External Access: For penetration testing purposes, a single machine per subnet is intentionally exposed to the public internet. This machine serves as the initial access point for the penetration test. After gaining a foothold on this system, the penetration tester can pivot to other machines within the subnet.

4 Performance Analysis

4.1 VM Availability
4.2 CPU Average
4.3 Disk Bytes
4.4 Network
4.5 Disk Operations (Figs. 7, 8, 9, 10 and 11).

5 Vulnerability Introduction

This section details the vulnerabilities intentionally introduced into the testing environment for analysis purposes.

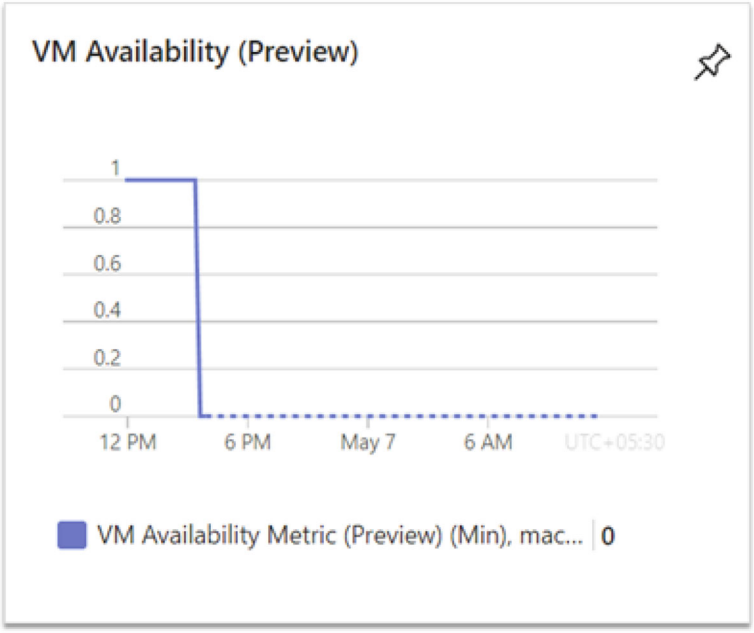


Fig. 7 VM availability for virtual network audit

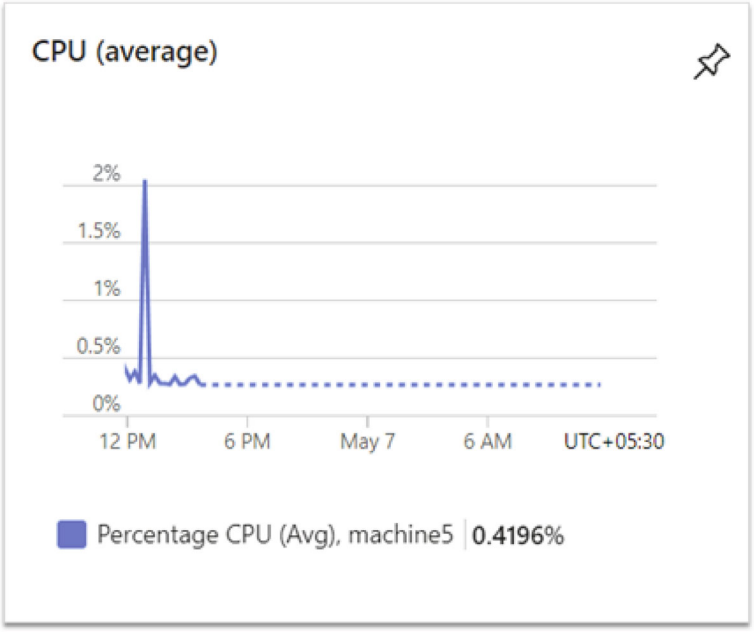


Fig. 8 CPU average for machine1 on subnet 1

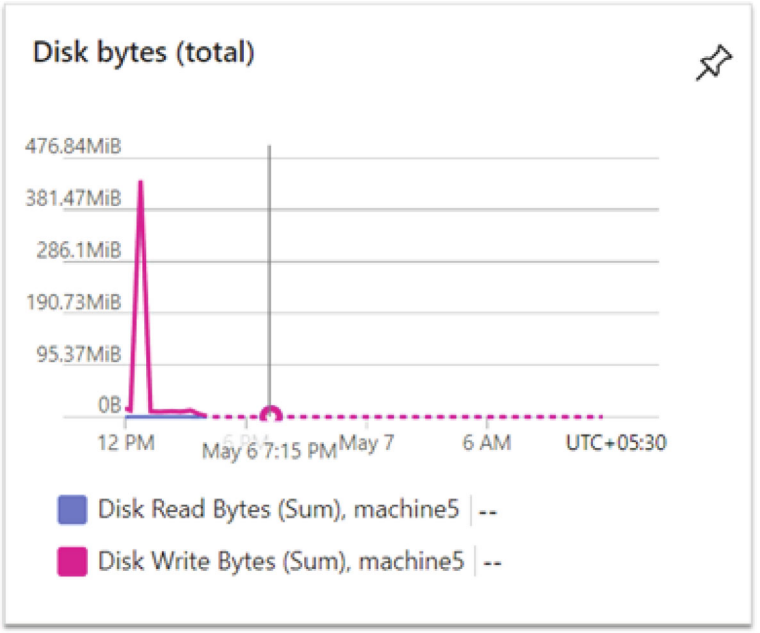


Fig. 9 Disk average for machine5

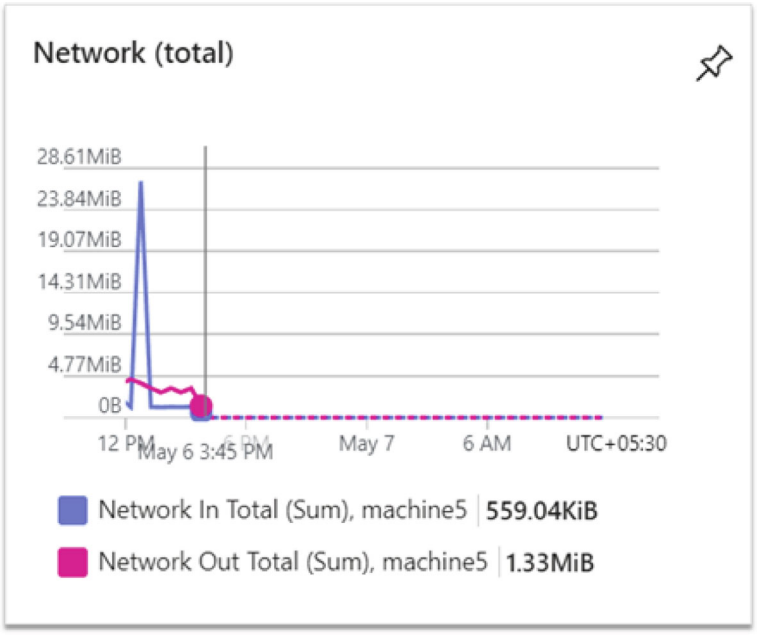


Fig. 10 Network inbound and outbound traffic metrics

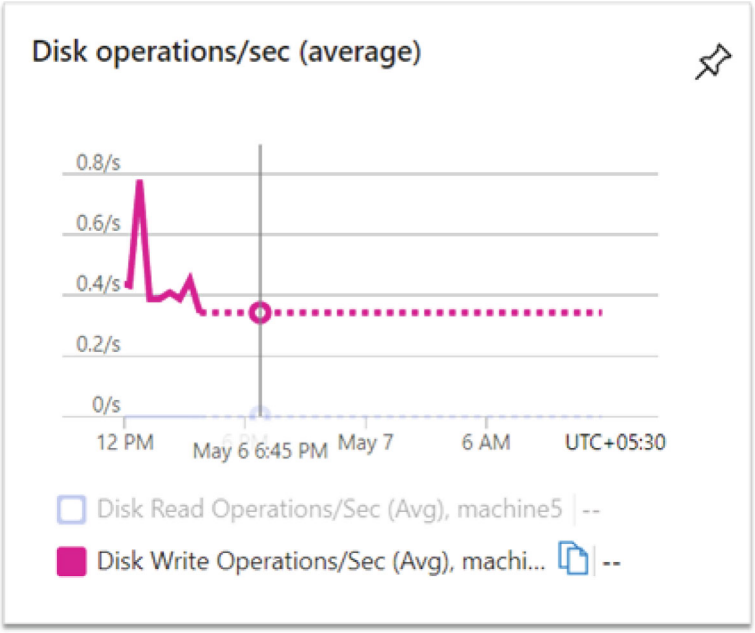


Fig. 11 Disk operations for machine5

5.1 Machine 1: Web Application Vulnerabilities

Machine 1 serves as the primary testing environment and hosts the DVWA web application. The following vulnerabilities have been deliberately configured within DVWA to simulate real-world threats:

- Brute-force Attack: This vulnerability allows attackers to attempt unauthorized login by trying various username and password combinations [2].
- Command Injection: This vulnerability occurs when user-supplied input is not properly sanitized, enabling attackers to inject malicious code that executes on the server [2].
- Cross-Site Request Forgery (CSRF): This vulnerability tricks a user's browser into performing unintended actions on a trusted website [3].
- Open Redirects: This vulnerability exploits improper configuration where user input is used to redirect the user to a malicious website [4].
- Reflected Cross-Site Scripting (XSS): This vulnerability allows attackers to inject malicious scripts into web pages that are reflected back to the user's browser, potentially stealing data or compromising the user's session [5].
- SQL Injection (SQLi): This vulnerability occurs when user input is not properly validated, enabling attackers to inject SQL code that interacts with the back-end database [6].

5.2 Machine 2: SMB File Transfer Vulnerabilities

Machine 2 is configured to be vulnerable to specific exploits targeting SMB (Server Message Block) file sharing protocol:

- SMBGhost: This vulnerability allows remote code execution on vulnerable SMB servers [7].
- EternalBlue: This well-known exploit leverages a vulnerability in SMBv1 to gain unauthorized access to systems [7].
- EternalChampion: This exploit targets a different vulnerability in SMB versions to achieve similar unauthorized access as EternalBlue [7–12].

5.3 Machine 3: Linux Kernel Vulnerabilities

Machine 3 introduces vulnerabilities related to privilege escalation on Linux systems:

- Dirty Pipe: This vulnerability allows local attackers to potentially gain root privileges on a system by exploiting a race condition during file writing operations.
- Dirtybomb: Similar to Dirty Pipe, this vulnerability exploits a vulnerability for potential privilege escalation.

It's important to note that these vulnerabilities are intentionally introduced for testing purposes in a controlled environment. In a production environment, such vulnerabilities should be addressed immediately to mitigate security risks.

6 Intended Use Case

This testing environment provides a valuable platform to test and implement the Identify function of the NIST Framework. It allows security professionals to:

- Identify assets within the network (Machines 1–6 and DVWA platform).
- Identify vulnerabilities within the DVWA platform and potentially the network itself.
- Identify controls in place and assess their effectiveness.

By testing in a controlled environment, security professionals can refine their skills and identify potential weaknesses before deployment in a production environment.

7 Conclusion

This study provides a foundational understanding of the network architecture for DVWA testing. While subnets offer some segmentation, further security measures like access controls and intrusion detection are recommended. Performance analysis is essential to ensure the network can handle current and future loads. The vulnerabilities identified in the DVWA platform should be addressed to strengthen its security [6]. This testing environment serves as a valuable tool for implementing the Identify function of the NIST Framework, enabling stakeholders to identify and address potential security risks before they impact production systems. Proactive network management and continuous improvement are crucial to maintain a secure and efficient network infrastructure.

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Legal and Digital Regulations for Share Repurchase in Private Joint-Stock Companies: A Comparative Study with Emphasis on Technology Impact



Yasar Alhiniti and Dina Aljabari

Abstract The focus of this study is to examine the legal consequences of share repurchase in private joint-stock companies and its effect on the rights of creditors, while also delving into the influence of digital transformation on these processes. To begin, the study explores the concept of capital stability as a fundamental safeguard for creditors, considering both theoretical definitions and the legal frameworks that govern it. By analyzing and comparing legal texts and regulations with British legislation, the adequacy of these measures in protecting creditors' rights and ensuring business continuity is evaluated. The study reveals that the capital of a private joint-stock company is a reflection of its financial solvency and its ability to fulfill its obligations, making it a crucial guarantee for creditors. However, the existing legislation, despite establishing a minimum capital requirement, needs to be reinforced with more stringent regulations and procedural controls, especially in the context of digitalization, to regulate share repurchases from capital. Furthermore, the study highlights that improper financing of share repurchases from a company's capital can undermine the overall guarantee for creditors, emphasizing the necessity of implementing robust legal measures to safeguard their rights. Considering the impact of digital technologies on corporate practices, this study underscores the importance of updating legal frameworks to incorporate technological considerations. Based on these findings, the study provides several recommendations to improve legislation, including the amendment of existing laws, the establishment of monitoring mechanisms for the impact of share repurchases, the promotion of legal awareness among companies and creditors, and the examination of international best practices, particularly those that integrate digital tools.

Keywords Capital · Private joint-stock companies · Share repurchase · Creditors' rights · Legal guarantees · Digital transformation · Technology impact

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1 Introduction

When a company engages in the process of repurchasing its shares, it triggers a variety of legal consequences that have implications for the company itself, its capital, shareholders, and creditors. These consequences encompass a range of obligations for the company and establish rights in relation to the redeemable shares held by shareholders, as stipulated by the provisions that govern private joint-stock companies and are based on the agreement among shareholders. Given that the majority of legal regulations governing these companies, as per corporate law, are optional rather than obligatory, the contract between the parties serves as the governing law, establishing rights and obligations for both the company and its shareholders. It is essential for both parties to adhere to the terms outlined in this contract, including the rights and obligations that it entails.

When discussing the legal implications of the repurchase process, the following questions arise:

- What are the legal obligations of the company as a result of the share repurchase process?
- What is the legal effect on the company's capital resulting from the share repurchase process?
- What happens to the repurchased shares?
- Does the share repurchase process affect the legal status of the shareholder?
- What are the rights of holders of redeemable shares resulting from the share repurchase process?
- What are the legal impacts on the rights and guarantees of the company's creditors as a result of the share repurchase process?

1.1 Study Objectives

This study aims to achieve the following objectives:

- Improve legal and practical understanding of share repurchase processes and ensure protection for all parties involved in privately held stock companies.
- Analyze the legal framework related to the purchase of capital and shares in private joint-stock companies.
- Review theoretical concepts of the capital stability principle and its role as a guarantee for creditors
- Evaluate Jordanian legislation on share buybacks and compare it to UK legislation.
- Providing legal recommendations aimed at strengthening the protection of creditors' rights and regulating share purchase processes.
- Analyze the practical impact of share buyout processes on the company's capital and creditors' rights.

1.2 Study Methodology

By adopting a descriptive-analytical methodology, the research delved into the examination of legal documents and regulations in Jordan that pertain to share repurchase in private joint-stock companies. A comparative analysis was conducted, specifically comparing these findings with the corresponding legislation in the United Kingdom. To draw well-founded conclusions and provide insightful recommendations concerning the effects of share repurchase on the rights of creditors and the ongoing operations of companies, the researcher extensively relied on secondary sources such as legal textbooks, scholarly articles, and a variety of legal regulations.

2 Legal Implications of Share Repurchase on the Company and Shareholders

The legal implications of share repurchase for the company include several obligations that the company must adhere to. These obligations are as follows [1]:

- Obligation to pay the value of the repurchased shares to the holder of the redeemable shares.
- Notify the Companies Regulatory Official in writing of the repurchase decision.

2.1 Obligation to Pay the Value of the Repurchased Shares to the Holder of the Redeemable Shares

If the company's bylaws stipulate the repurchase of redeemable shares for consideration, an obligation arises. The Redeemable Shares Instructions for Private Joint-Stock Companies of 2020 [2] state that the repurchase process may involve consideration or be without consideration, although it is generally required according to the concept of repurchase. As such, the company is required to compensate for the repurchased shares, either at their nominal value or at a value specified in the company's bylaws. The researcher believes that the legislator, in the Redeemable Shares Instructions, has not prescribed a specific value for the consideration of redeemable shares. Instead, it is left to the agreement of the shareholders as outlined in the company's bylaws, whether it be the nominal value of the shares or a value agreed upon.

In light of the information provided, if the repurchase transaction includes a financial aspect, the company is obligated to outline in its bylaws the precise procedure for determining the monetary consideration and the method of payment [3]. This procedure must be based on a straightforward and well-defined mathematical formula that leaves no room for ambiguity. The calculation of the value of redeemable shares is determined either by the nominal value of the share or an agreed-upon value, which

could be the book value or market value of the share, as verified by a report from the company's auditor [4].

According to the researcher, it is recommended that the redemption price of shares should be determined based on either the book value or the market value at the moment of repurchase. This approach ensures that the shareholder holding the redeemable shares receives a fair price that accurately reflects the true value of the shares. However, it is important to consider the potential consequences of not establishing a specific limit or cap on the repurchase consideration.

According to the researcher, the Jordanian legislator has mandated that companies establish a specific mechanism for determining the price and payment method of redeemable shares in their contracts and bylaws. However, there is no specific limit or cap set for this consideration. For instance, a company could repurchase one thousand redeemable shares for either one hundred thousand dinars or one hundred dinars. This lack of consistency goes against principles of fairness, as the value of these shares should not be over or underestimated. Even with a specified mechanism for calculating the repurchase consideration, the absence of a specific limit or cap could result in unfair treatment of shareholders and potential misuse by company founders, as the consideration does not accurately reflect the true value of the shares. The researcher argues that the Jordanian legislator should impose a maximum limit or cap on the repurchase consideration, aligning it with the actual value of the shares, in order to safeguard shareholders and prevent the misuse of company funds for personal gain. This process could be linked to a report from the company's auditor, verifying the true value of the shares at the time of repurchase, thus preventing any manipulation of the consideration by the company, whether by increasing or decreasing it.

2.2 Notifying the Companies Regulatory Official in Writing of the Repurchase Decision

In order to proceed with the repurchase, the company is obligated to submit the decision for approval to the Companies Regulatory Official. As we have previously discussed, the approval for the repurchase can be granted by either the company's General Assembly, its Board of Directors, or through a recommendation from the Board to the General Assembly for the approval of the share repurchase. This decision must comply with the procedural and legal requirements for General Assembly or Board meetings. Additionally, it must contain the necessary information as outlined in Article 6 of the instructions, as mentioned earlier [5]. The execution of the repurchase must be accurately recorded in the shareholders' records and reported to the Companies Regulatory Official, in accordance with Article 83/A/B/Repeated of the Jordanian Companies Law [6].

A question arises here: What is the legal effect on the company's capital as a result of the share repurchase?

The researcher believes that the legal effect on the company's capital resulting from the share repurchase manifests in two ways:

- **First Scenario**: To analyze the impact of a share repurchase on the capital of the company, one can refer to Article 82/C/Repeated of the Jordanian Companies Law [7]. In the case where redeemable shares are deemed unpaid, these shares can be eliminated, resulting in a reduction of the company's capital by the nominal value stated in the company's contract and bylaws. This reduction can be carried out without following the procedures outlined in paragraph (B) of the same article [8], and creditors do not possess the right to raise objections.
- **Second Scenario**: When examining the impact on the company's capital due to financing the repurchase from it, a thorough analysis will be conducted while discussing the legal consequences on the company's creditors resulting from the repurchase.

Additionally, it is important to address the following question: What is the fate of the repurchased shares?

As mandated by Article 4/W of the Redeemable Shares Instructions, the company must outline the destiny of the repurchased shares in its contract and bylaws. These repurchased shares can either be retained by the company, reissued and sold, or canceled to decrease the company's capital, in accordance with Article 82 of the Companies Law.

Upon careful examination, it is evident that the researcher has discovered an interesting fact. In cases where a company's bylaws explicitly state that the company will retain repurchased shares, the Jordanian legislator has unfortunately failed to mandate the creation of a dedicated fund for these shares. This oversight results in a lack of clarity, as the repurchased shares are simply held under the company's name, causing confusion with treasury shares. It would have been more desirable for the Jordanian legislator to enforce the establishment of a fund specifically designated for holding repurchased shares until they are ready to be reissued and sold.

When discussing the legal effects of share repurchase on the shareholder, the following questions arise:

- Does the share repurchase affect the legal status of the shareholder?
- What are the rights of holders of redeemable shares resulting from the share repurchase?

The repurchase of shares has a direct impact on the legal status of shareholders. When shares are repurchased, shareholders exit the company and receive compensation for their shares. This change in legal status occurs during the company's lifetime [9]. Additionally, if shareholders acquire different types of shares through a capital increase, their legal status may also change. In this case, they become shareholders in proportion to the increase, as determined by a decision made by the company's extraordinary General Assembly, which is separate from the repurchase decision [10].

As for the rights of the shareholder holding redeemable shares, they include:

1. The company's bylaws outline the various rights associated with this particular type of share, including attending and voting at General Assembly meetings, distribution of profits and losses, and priority rights in case of liquidation. These rights and advantages are granted to this type of share as stipulated in the company's contract and bylaws, in accordance with Article 68/A/Repeated of the Companies Law [11].
2. If the repurchase of shares is done for consideration, the shareholder has the right to demand that the company compensates them by paying the price of the repurchased shares.
3. The shareholder possesses the legal entitlement to request that the company refrain from postponing the payment for the repurchased shares, as it can result in detrimental consequences for the shareholder [12].
4. As per Article 7/4/B of the instructions [12], shareholders possess the right to initiate legal proceedings against the company in the appropriate courts if the company declines to carry out the repurchase, neglects to provide compensation for the repurchased shares, or delays payment of said compensation.

The researcher suggests that the Jordanian legislator should take into consideration the concept of a preferred creditor when the repurchase of shares fails or cannot be carried out. In the event of liquidation, shareholders who hold redeemable shares should be treated as preferred creditors, with priority over other shareholders and creditors in recovering their compensation for shares that were not repurchased while the company was still operating. Redeemable shares are similar to a debt with a fixed return, but unlike traditional debt, the holder of these shares does not receive interest. Instead, they earn profits from these shares. Therefore, when the repurchase conditions are met, the shareholder should be able to recover the value of their shares during the company's existence, without the concept of a fixed return being applied. This is because granting fixed benefits to the shareholder, even in the absence of profits, would require using the company's capital or mandatory reserves to pay the fixed return, which compromises the protection of creditors. Therefore, adopting the idea of a preferred creditor for holders of redeemable shares would provide them with protection in cases where the repurchase process fails. The British legislator has already addressed the legal consequences of share repurchase on the company, its capital, and the shareholder [13], as follows:

- According to section 689 of the UK Companies Act, the company is obligated to inform the Companies Regulatory Official about their decision to repurchase [13].
- As outlined in Section 686 of the UK Companies Act, it is a requirement for the company to bear the cost of repurchased shares, whether it is paid at the time of repurchase or at a later agreed-upon date [14].
- Within the UK Companies Act, specifically in Section 688, provisions are outlined for the cancellation of repurchased shares, capital reduction, and the departure of shareholders who possess these shares from the company [15].

The Jordanian legislator's perspective on the legal consequences of share repurchase for the company, its capital, and the shareholder closely resembles that of the British legislator, albeit with minor variances.

3 Legal Effects of Repurchase on the Company's Creditors

The general assurance for creditors of a private joint-stock company lies in its capital. This capital serves as the fundamental and essential method of safeguarding their rights and serves as the primary motivator for their consent to the company's debt. The financial stability, debt repayment capability, and resilience to potential financial challenges are all reflected in the company's capital.

The foundation of the company's financial resources rests upon the fundamental concept of capital stability, which serves as a broad assurance for creditors. Legal scholars have offered different interpretations of this principle. Some define it as the obligation to maintain the capital at its originally agreed upon amount, or as modified through increases or decreases. Others define it as the safeguarding of the company's capital in relation to creditors who entered into agreements with the company based on that capital, granting creditors the authority to object to any actions that may undermine the overall protection provided by law for their benefit [16–18].

The second doctrinal definition of the principle of capital stability, as advocated by the researcher, serves as a safeguard for the company's creditors. This principle is crucial for creditors when extending loans to the company, as it relies on the company's financial stability to guarantee their ability to recover the debt. It is important to note that creditors establish this debt based on the company's capital at the time of the agreement, rather than solely relying on the minimum capital required by law. The company's capital plays a vital role in facilitating its operations, sustaining its activities, ensuring its ongoing existence, and safeguarding the rights of its creditors.

Considering that the company's capital serves as a guarantee for creditors, the repurchase of shares from the specified funding sources mentioned in Article (5/A) of the Instructions for Redeemable Shares [19] should not have any impact on the rights of creditors in relation to the company's capital [20]. Therefore, the following questions arise:

- What are the legal effects on the company's creditors if the repurchase of shares is financed from the company's capital? Does this harm the creditors?
- What is the legal effect on the company's capital if the repurchase is financed from it?

In Article (66/A/Repeated) of the Companies Law, the Jordanian legislator has established a minimum capital requirement for private joint-stock companies, which must not be less than $7000. This provision serves as a safeguard and assurance for creditors, shareholders, and the continuous operation of the company. In certain circumstances, such as when the company exceeds its needs or experiences losses, the company may reduce its capital [21–25]. However, it must ensure that the reduction

does not fall below the minimum legal requirement and provide justification for the reduction and its impact on the company's obligations, taking into consideration the rights of creditors and avoiding any harm to them. To address the concerns of creditors regarding capital reductions, the Jordanian legislator has granted them the right to object to such decisions, as stated in Article (82/Repeated) of the Companies Law. This article outlines two scenarios in which creditors can exercise their right to object to capital reductions as follows:

- **First Case: Reduction of the Authorized and Unsubscribed Capital**

The specified procedures for capital reduction outlined in this article do not apply to the company in question, and creditors are not permitted to raise objections to the decision to reduce capital. This is due to the fact that the authorized capital, which remains unsubscribed and unpaid, lacks assets or resources of equal value. As a result, it does not impact the overall security for creditors, as there is no tangible value from which debts can be recovered [26–31].

- **Second Case: Reduction of the Subscribed and Paid-Up Capital**

In this case, the company must follow the capital reduction procedures outlined in this article, which include the following:

1. In order to reduce the company's capital, a decision must be made by the General Assembly.
2. In order to comply with the requirement, it is necessary to have the announcement published consecutively in a daily newspaper for a minimum of three times.
3. Within a span of 15 days from the final announcement, creditors possess the authority to raise objections to the reduction decision by contacting the Companies Regulatory Official.
4. Within a period of 30 days from the date of submission, it is the responsibility of the Companies Regulatory Official to effectively handle any objections raised by the creditors.
5. In the event that the objection of a creditor is not resolved by the Companies Regulatory Official, they have the option to appeal to the competent court against the reduction decision. It is important to note, however, that this appeal does not have the power to halt the reduction procedures unless the competent court determines otherwise [32].

This leads us to differentiate between creditors' rights arising before the company makes the reduction decision and creditors' rights arising after the company has made the decision, as follows:

1. **First Case**: In accordance with Article (82/B/Repeated) of the Companies Law [4], creditors maintain the right to object and appeal concerning the pre-existing rights that arose prior to the reduction decision, following the specified procedures.

2. **Second Case**: Once the reduction decision has been made, it is important to note that creditors are bound by this decision and are unable to challenge or contest it. This is due to the fact that creditors acknowledge and recognize the company's capital as it stands after the reduction, rather than the original capital before the reduction took place [33]. This further reinforces the doctrinal concept of capital stability that was previously discussed.

To ensure the stability of capital, it is crucial to acknowledge concerns regarding the funding of the redemption process using the company's own capital. The legislator has implemented the principle of capital stability in various ways, one of which is by setting a minimum capital requirement for private shareholding companies. It is important to note that the company is prohibited from redeeming any portion of this minimum capital, as doing so would undermine the guarantee that creditors rely on to secure their debts. While the company cannot issue redeemable shares that are equivalent to the minimum capital, it does have the option to issue redeemable shares that exceed this threshold. For instance:

In the event that the company's subscribed capital amounts to $ 141,085.30, with $ 70,542.65 allocated to redeemable shares, a scenario may arise where these shares are redeemed using funds from the company's capital due to the depletion of alternative financing sources. As a consequence, the subscribed capital would be reduced to $ 70,542.65. This reduction would have a detrimental impact on creditors, as it would weaken the overall guarantee provided by the company's capital at the time of entering into contracts, surpassing the minimum requirement set by law. Consequently, the 70,542.65 redeemable shares would no longer accurately represent the actual capital and would merely serve as a superficial credit, even if the legislator grants the right to challenge this reduction.

According to the researcher, utilizing the company's capital to fund the redemption process, as allowed by Article (5/B) of the Jordanian regulations [1, 6], carries significant risks due to the absence of sufficient safeguards, aside from exhausting alternative financing options. It would have been more prudent for the Jordanian legislature to establish legal measures and protocols akin to those implemented by their British counterparts, in order to protect the rights of creditors, safeguard the interests of shareholders, ensure the company's continuity, and accomplish its objectives. These specific measures and protocols are detailed in Chapter Five of the British Companies Act, specifically Articles (709–723) [9].

4 Conclusion

According to the study, the main assurance for creditors and an indication of a company's financial stability and ability to fulfill its obligations lies in the capital of private joint-stock companies. In Jordan, there are comprehensive legal provisions that specifically safeguard the rights of creditors in share redemption scenarios.

Nevertheless, the study emphasizes the necessity of strengthening the legal regulations governing share redemption procedures in order to provide enhanced protection for creditors and ensure the stability of companies.

4.1 Results

The study reached the following results:

- The presence of capital in private joint-stock companies acts as a broad assurance for creditors, while the principle of capital stability not only safeguards their rights but also strengthens the overall financial credibility of the company.
- In order to safeguard the rights of creditors, Jordanian legislation establishes a minimum capital requirement, although there is a need for more stringent controls to be implemented to effectively regulate share redemption processes.
- If share redemptions are financed using the company's capital without proper execution, it can have adverse effects on creditors' rights and potentially undermine their overall guarantee.
- In order to safeguard the rights of creditors and ensure the stability of companies, it is necessary to implement legal procedures that are akin to those found in British legislation.

4.2 Recommendations

Based on the results obtained, the study recommends the following:

- Amend Jordanian legislation to include more stringent controls and procedures for the redemption of shares from capital.
- Establish mechanisms for regular monitoring and assessment of the impact of share redemptions on creditors' rights.
- Increase the legal awareness of companies and creditors about the potential effects of share redemption and ways of protecting their rights.
- Learn about the experience of other countries, such as the UK, in regulating share redemptions and apply best legal practices to Jordanian legislation.
- Conduct training and workshops for lawyers and financial advisors to familiarize them with the new legislation and ensure it is applied in a way that protects the rights of all parties involved.

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The Impact of Green Human Resources on the Promotion of Social Responsibility Among Employees



Khaled Alzeaideen, Maan Hussein Mansour, Kafa Jalal Salman Hussein, and Odai Abd Alwahab Helal Alhamaideh

Abstract The objective of the study is to assess the influence of green human resources, including green recruitment, training and development, green human resource management and evaluation, and energy conservation, on the promotion of social responsibility among employees. In order to gather data, a descriptive analytical approach was employed, utilizing a questionnaire as the primary data collection tool. The findings revealed that the implementation of green human resources and social responsibility was moderate. Based on these results, the study recommends the integration of the green dimension into job descriptions for activities related to green projects and sustainable development, as well as the adoption of green management practices, particularly in high-level operations.

Keywords Green human resources · Social responsibility · Green human resource management · Energy conservation

1 Introduction

The growing emphasis on human resources has become more pronounced amidst a range of developments, as their pivotal contribution in navigating the ever-evolving challenges and circumstances within the corporate landscape is widely recognized.

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Consequently, it is imperative for management to anticipate and proactively address these challenges and circumstances, equipped with the necessary preparedness. A crucial and impactful factor in this regard is the implementation of green human resource management, which assumes a significant role in addressing environmental concerns and ensuring the sustainable utilization of available resources [7]. This is achieved through the incorporation of an environmental management approach that seamlessly integrates environmental objectives into all facets of green human resource management practices within the business environment, thereby fostering an environmentally conscious ethos [17].

The establishment of strong and interconnected relationships between organizations and the community, as well as the government, relies heavily on the concept of social responsibility. This concept aims to bring about both tangible advantages for the company and ethical benefits for the community. To overcome obstacles like the scarcity of skilled administrative professionals in carrying out social responsibility initiatives, strategic planning must incorporate the notion of social responsibility. One approach to address this is by integrating other management concepts such as green human resource management [11]. Additionally, human resources play a vital role in preserving the environment and directly impacting environmental concerns. Through training and education, human resource management plays a critical role in instilling a sense of social responsibility in employees, allowing for a balance between economic, social, and organizational objectives. Consequently, it is crucial to examine the influence of human resources on fostering green social responsibility among employees within the Directorate of Education in Rusaifa District.

1.1 Problem Statement

Promoting green human resources practices has an intense impact on the working environment in various sectors. It is appropriate to incorporate an environmental view and management into traditional human resource management. Through the researcher's examination of studies and literature, including Al-Touqairi's [12] study on green human resources in Ministries of Education, it has been discovered that these studies reveal the presence of environmental challenges and issues that pose a risk to humanity. Consequently, current generations, thanks to a growing ecological mentality and growing awareness, are taking responsibility for environmental protection. Moreover, research by Al-Maher and Dawood [5] highlights that social responsibility is the foundation of society, necessary to cope with both ordinary and unforeseen changes and circumstances. For example, the COVID-19 pandemic has exposed organizations and societies to a decline in environmental consciousness among the general population, specifically within the Directorate of Education in the Rusaifa District.

The transition from childhood to adulthood is a crucial period in which individuals seek self-fulfillment. This journey requires guidance and support to prepare individuals for integration into adult society, shouldering responsibilities, and understanding

behaviors that promote the protection and care of the environment [6]. It is essential for human resources to play a significant role in maintaining the environment and mitigating human-induced environmental impacts. Recognizing the challenges faced by employees and directorates in this regard, the researchers, drawing upon their experience in the educational field, has undertaken a study to explore the influence of green human resources on social responsibility among employees in the Directorate of Education in Rusaifa District [3].

To achieve optimal resource consumption and reduce environmental pollution, it is necessary to redesign human resources in accordance with laws and policies that emphasize the avoidance of excess and regulation of resource consumption. In light of these considerations, the main question that the study aims to address is: Does the implementation of green human resource practices have an impact on the promotion of social responsibility among employees in the Directorate of Education in Rusaifa District?

1.2 Study Hypothesis

Based on the study problem and its objectives, the main study hypothesis is formulated as follows:

- HO1: "There is no statistically significant impact at the significance level ($\alpha \leq 0.05$) of green human resource practices with its dimensions (green recruitment, green training and development, management and evaluation, and energy conservation) on social responsibility among employees in the Directorate of Education in Rusaifa District."

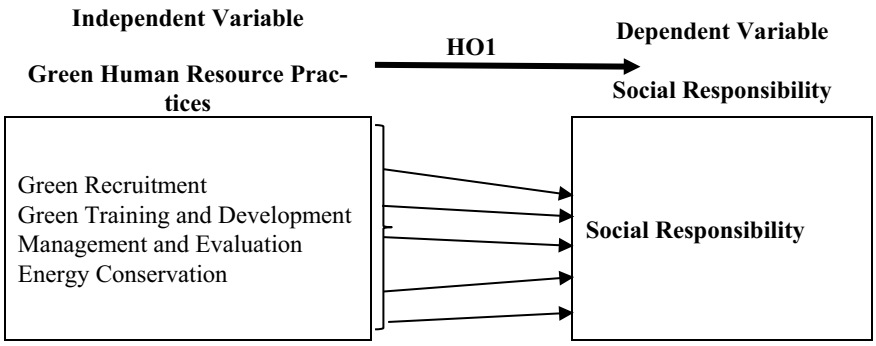
1.3 Study Model

The study model and its variables are illustrated in Fig. 1.

2 Literature Review

2.1 Green Human Resources

The concept of green human resources encompasses the creation, execution, and ongoing maintenance of a system that aims to cultivate environmentally conscious employees within the workplace [8]. The focus of green human resource management is to convert traditional employees into individuals who prioritize environmental responsibility, ultimately leading to the attainment of environmental objectives and



Source: Referring to the following studies: (Al-Sakran, 2017), (Mansour and Aishoush, 2024), (Al-Zeftawi, 2023), (Mansour and Mansour, 2020).

Fig. 1 Study model. [10, 13, 19, 24, 25] *Source* Referring to the following studies:

the promotion of sustainable practices. This has a positive impact on employees themselves, as well as the natural environment, society, and the overall business landscape. However, as Mostafa et al. [26] explain that green human resources is one of the most important techniques used by an organization to improve its performance and achieve environmental goals. This green behavior reflects a high level of environmental awareness and helps reduce the negative impact of human activity on business. It includes practices such as energy conservation, recycling, waste reduction and water conservation.

As Muntari et al. [27] argue that "green human resources practices and interventions aim to improve employee skills and increase environmental responsibility, as well as the efficient use of resources." This is done through a range of practices, including green recruitment, environmental education and training, incentives and rewards, green performance evaluation, employee participation and green team spirit.

2.2 Green Human Resource Practices

There is a range of viewpoints among scholars and researchers when it comes to green human resource practices and their various aspects. Some experts emphasize four dimensions, namely green recruitment, green training and development, green performance evaluation, and green wage and incentive systems [29]. Al-Qaraleh [9] delved into recruitment and selection as well as performance evaluation, while Anwar et al. [14] focused on three dimensions: green competence-building practices, green motivation-enhancing practices, and green participation practices. On the other hand, there are those who highlight five dimensions: green compensation, green performance management and evaluation, green training and development, green recruitment, and green job analysis and design [22].

To accomplish sustainable development and preserve the environment, green human resources play a vital role by effectively utilizing the organization's resources to create an environmentally conscious workplace. This fosters a greater sense of environmental awareness among employees, leading to heightened interest and commitment to sustainability matters [20]. The current research adopts the following dimensions and practices:

- **Green Recruitment**: In order to prioritize the environment within the workplace, organizations must carefully hire individuals who possess the necessary expertise, skills, and knowledge of relevant environmental processes [4]. The environment and related initiatives are integral components of human resource operations. These functions play a crucial role in fostering the development of employee competencies and skills, ultimately contributing to the achievement of organizational objectives. By equipping employees with diverse skills, knowledge, and behaviors, organizations can enhance performance levels and productivity while minimizing costs and efforts. This process is essential for achieving desired goals within specified timeframes [28].
- **Green Human Resource Management and Evaluation**: To improve employee performance and achieve organizational goals, it is crucial to integrate environmental policies and indicators with performance, conduct benchmarking to accurately identify the source and cause of problems, acknowledge gaps, and offer solutions to mitigate their negative impact until they are resolved, thereby promoting continuous improvements in environmental outcomes, including incidents and responsibilities.
- **Energy Conservation**: The practice of conserving energy in various forms, with the aim of protecting the environment, reducing fuel costs, and promoting individual and community-wide responsibility, is a behavior advocated for efficient energy utilization [1].

2.3 Concept of Social Responsibility

The emergence of the notion of social responsibility was a response to economic crises and their negative consequences, aiming to achieve organizational objectives while considering the interests of others. Social responsibility is a modern concept in management, and although administrators may have different definitions, they agree on its fundamental nature. It encompasses all actions and practices undertaken by organizations to safeguard and manage society, as well as prioritize the well-being of the community [18]. According to the World Business Council, social responsibility is defined as the ongoing commitment of businesses to ethical conduct, along with contributing to economic growth to enhance the quality of life for employees and their families in the local community and society as a whole [15].

Dimensions of Social Responsibility

Many specialists and business pioneers have focused on the social dimension, which is the cornerstone of social responsibility. Caroll presented a model in the field of social responsibility based on four dimensions:

- **Economic Responsibility Dimension**: It refers to highlighting profit achievement for owners, workers, management, and shareholders.
- **Legal Responsibility Dimension**: Organizations are required by law to practice their activities and perform various tasks in accordance with regulations, viewing social responsibility as a duty that not only ensures profitability but also aligns with legal obligations.
- **Ethical Responsibility Dimension**: In order to carry out its functions and activities, the organization must adhere to a set of ethical behaviors that are in line with customs, traditions, ethical systems, values, mutual respect, and cooperation, all while ensuring that society is not harmed and its components are not compromised.
- **Philanthropic Responsibility Dimension**: The fundamental principle of social responsibility lies in voluntarily contributing to community reform programs, supporting local development initiatives, ensuring the organization's growth and operation, and bolstering its reputation within society [23].

2.4 Green Human Resources Practices and Social Responsibility

The significance of incorporating green human resources into organizational practices has become apparent as it contributes to various aspects of organizational functioning. These include improving employee retention rates, enhancing the overall image of the organization, refining recruitment strategies, boosting productivity, conserving energy, promoting sustainable use of environmental resources, and reducing behaviors that harm the environment. In today's world, organizations prioritize social responsibility initiatives that address social issues [2]. By embracing green human resources, organizations can foster a sense of social responsibility among employees, utilizing it as a driving force for business development and positively impacting the workforce. It is not solely the responsibility of employees, HR managers also play a crucial role in educating and training employees on social responsibility. They achieve this by developing and implementing social responsibility plans and monitoring their effectiveness. Research has demonstrated that organizations that integrate social responsibility into their core strategies with a focus on green human resources not only benefit their employees but also the organization as a whole [11].

The correlation between green human resources and social responsibility has been determined by researchers to be robust and intimate. Social responsibility is regarded as a vital and encouraging element for employees across all hierarchies. Its initiatives

encompass the establishment and preparation of both material and ethical support programs for community endeavors. Green human resources management seamlessly integrates into the organization's holistic functioning, permeating green recruitment and selection, green training and development, green performance evaluation, and subsequently formulating progressive and contemporary administrative protocols and regulations that align with the goals of green management.

2.5 Previous Studies

In an effort to explore the connection between green human resources management (GHRM) and sustainable development, Dweif [17] conducted a study. The study focused on the various dimensions of GHRM, including green compensation and incentive systems, green health and safety management, green training and development, green performance evaluation, green recruitment, and green job analysis and design. The study utilized a descriptive-analytical approach and targeted food industrial companies affiliated with the Food Industries Holding Company in Greater Cairo, Egypt. The findings of the study revealed a positive impact relationship between the dimensions of GHRM and sustainable development. As a result, one of the key recommendations put forth was the implementation of training programs to enhance environmental awareness within food industrial companies.

In her research conducted in 2024, Guleshan sought to delve into the impact of corporate social responsibility (CSR) on how consumers perceive businesses. As this was an exploratory study, it was conducted to understand how the different components of CSR (philanthropic, environmental, economic, ethical and legal) lie with customers. These results were then compared with the results of already conducted studies. A wide variety of participants (students, staff and lecturers) participated in the study conducted by the Technical College of Management at Duhok University of Technology. A sample of 75 people from various countries were invited to participate in the study. The result showed that there is much greater moral responsibility than social and economic responsibility.

Ziyadeh et al. [30] conducted a study to elucidate the relationship between three dimensions of GHRM (energy conservation, green recruitment, and green compensation and reward systems) and the sustainability of healthcare organizations in Palestine. The study used descriptive-analytical method to explain the study. The study used a sample of human resources and quality managers who work in healthcare institutions in Palestine. The study found that the three dimensions of GHRM have a significant positive impact on the sustainability of healthcare organizations. The study also provided some key recommendations such as raising awareness about environmental protection and its positive impact on GHRM. Researchers recommend conducting workshops and training for employees in order to increase their competences in the field of green skills and competencies and their positive impact on the sustainable development of the organization due to its environmental nature.

Jehan et al. [21] conducted a study to investigate the impact of GHRM (Green Recruitment and Selection, Green Performance Assessment, Green Training and Development, Green Compensation) practices on environmental behavior in educational organizations in Baltistan, Iran. Using a descriptive and analytical approach, researchers conducted a survey in which the respondents were 300 employees of government universities. The findings highlighted the positive effects of GHRM practices both directly and indirectly through the mediating variable PEB.

3 Study Methodology

3.1 Study Population and Sample

The sample for this study comprises approximately 140 employees who are currently employed at the Education Directorate in the Al-Rusaifeh District. Since the total number of employees is relatively small, all 140 employees from the Education Directorate in the Al-Rusaifeh District were included in the study sample.

3.2 Reliability Coefficient

To assess the reliability of the questionnaire as a data collection tool for this study, Cronbach's Alpha was utilized to measure internal consistency. The internal consistency of the questionnaire items was evaluated using Cronbach's Alpha, and the results are presented in Table 1.

Based on the data presented in Table 1, it can be observed that the reliability coefficient for both the independent variable (Green Human Resource Management) and the dependent variable (Social Responsibility) exceeds 70% [16]. This indicates a strong level of internal consistency among the items included in the study tool,

Table 1 Internal consistency coefficients (cronbach's alpha)

Dimension	Area	Internal consistency coefficient
Green human resource management	Green recruitment	0.724
	Green training and development	0.602
	Green HR management and evaluation	0.722
	Energy conservation	0.782
Social responsibility	Social responsibility	0.739
Overall tool		0.713

with a coefficient of 71.38%. These findings provide validation for the study tool's suitability in testing hypotheses.

3.3 Hypothesis Testing

The focus of this portion of the research is to analyze the outcomes of hypothesis testing, which were developed to align with the study's key questions and their significance. The objective is to assess the influence of Green Human Resource Management on Social Responsibility within the workforce of the Education Directorate located in the Al-Rusaifeh District.

Results Related to the Main Hypothesis

- **HO1:** "There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of Green Human Resource Management dimensions (Green Recruitment, Green Training and Development, Green HR Management and Evaluation, and Energy Conservation) on Social Responsibility among employees at the Education Directorate in the Al-Rusaifeh District."

To test this hypothesis, Multiple Linear Regression was used. The results of the hypothesis test are summarized in the table below (Table 2).

According to the data presented in the table, there is a positive correlation (correlation coefficient value of 0.861) between green human resource management practices and social responsibility. This means that as green HR practices increase, so does social responsibility. The coefficient of determination is 77.6%, indicating that the dimensions of green HR management explain 77.6% of the variation in social responsibility. The calculated value of F (135.629) is higher than the tabulated value at a significance level of 0.000, which is less than 0.05. As a result, the null hypothesis, stating that there is no statistically significant effect of green HR management and

Table 2 Results of multiple linear regression for hypothesis testing

Dependent variable	R	R^2	F	F Sig	Dimension	Beta	T	Standard Error	Sig
Social Responsibility	0.861	0.776	135.629	0.000	Green Recruitment	0.205	*4.786	0.000	0.205
					Green Training and Development	0.313	*5.981	0.000	0.313
					Management and Evaluation	0.209	*4.306	0.000	0.209
					Energy Conservation	0.101	4.131	0.000	0.101

its dimensions (green recruitment, training and development, green HR management and evaluation, and energy conservation) on social responsibility among employees at the Directorate of Education in Al-Rusayfah District, is rejected. Therefore, the alternative hypothesis, which states that there is a statistically significant effect of green HR management and its dimensions (green recruitment, training and development, green HR management and evaluation, energy conservation) on social responsibility among employees at the Directorate of Education in Al-Rusayfah District, is accepted. The impact of the dimensions of green human resource management on social responsibility among employees at the Directorate of Education in Al-Rusayfah District has been thoroughly examined. Each dimension, when analyzed individually, demonstrates a highly significant effect. The statistical analysis reveals that green recruitment has a significant effect on social responsibility, as evidenced by a t-value of 4.786 ($p < 0.001$). Similarly, green training and development also have a significant impact on social responsibility, with a t-value of 5.981 ($p < 0.001$). Moreover, the effect of green human resource management and evaluation on social responsibility is statistically significant, as indicated by a t-value of 4.306 ($p < 0.001$). Lastly, energy conservation is found to significantly influence social responsibility, with a t-value of 4.131 ($p < 0.001$).

3.4 Discussion of Results and Recommendations

The outcomes of this study reveal a notable influence exerted by green human resource management (HRM) strategies, encompassing green recruitment, training and development, green HRM management and evaluation, and energy conservation, on the level of social responsibility displayed by employees at the Directorate of Education in Al-Rusayfah District. The strong correlation coefficient value of 0.861 indicates a robust association between green HRM practices and social responsibility. Moreover, the coefficient of determination, which stands at 77.6%, suggests that the various dimensions of green HRM account for this percentage of the variation observed in social responsibility. Upon closer examination of each dimension individually, it becomes evident that all aspects of green HRM exhibit a statistically significant impact on social responsibility. These findings align with prior research conducted by Mansour and Aishoush [24] and Al-Sawi and Dabag [11], both of which also identified a positive influence exerted by green HRM practices on social responsibility. By implementing green HRM practices, employees develop a heightened sense of environmental awareness, enabling them to better grasp the importance of both local and global ecological issues, such as the preservation of natural resources and the consequences of climate change. Consequently, this enhanced awareness serves as a catalyst for employees to adopt environmentally responsible behaviors and integrate sustainable practices into their daily lives.

3.5 Recommendations

- Since GHRM practices contribute to achieving social responsibility and reducing environmental damage, the recommendation would be to improve GHRM practices in the Al-Rusayfah Education Directorate by emphasizing the implementation of environmentally friendly practices that contribute to environmental protection.
- Integrate sustainability and social responsibility standards into employee recruitment and evaluation processes, ensuring that the organization not only hires new employees, but also existing employees who perform in line with its environmental and social goals.
- Conducting training to increase employee awareness of environmental problems and ways to mitigate the effects of everyday practices.
- Encouraging them to save energy by conducting educational programs and seminars to increase their awareness of the importance of saving energy for the environment and society as a whole.

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Assessing the Psychological Barriers to Technology Adoption in Education: Strategies for Overcoming Resistance



Adnan Hassan Alsarayreh

Abstract Resistance to technology adoption in education is a prevalent challenge, often rooted in psychological barriers such as fear of change, anxiety, and lack of confidence. These barriers can be exacerbated by educators' feelings of incapability, especially if they have not kept pace with technological advancements or participated in ongoing professional development. This study explores the psychological factors contributing to resistance among educators, analyzing the dynamics of fatigue, forgetfulness, and the overwhelming nature of high-stakes educational environments. Through a qualitative research design, the study employs a descriptive approach to systematically review related literature and an analytical approach to examine underlying causes and potential strategies for overcoming resistance. The findings highlight the importance of providing supportive learning environments and tailored training sessions that alleviate apprehension and encourage positive attitudes towards technology integration. Ultimately, the study offers insights into creating a culture that promotes effective technology adoption in educational settings.

Keywords Technology adoption · Psychological barriers · Technology integration · Educational technology · Teacher attitudes

1 Introduction

Resistance is a natural reaction that can occur for several reasons. It can stem from a fear of change or an anxiety of being unable to use the new forms of technologies effectively. Oftentimes educators can develop a feeling of incapability whenever new technology is introduced into the classroom, especially if they have not kept pace with developments in technology and have not participated in ongoing professional

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development. Resistance can also stem from lack of motivation to use technology. Fatigue, forgetfulness and feeling overwhelmed, especially in an environment that promotes high-stakes accountability in school settings, are barriers that can hinder motivation or even willingness to go into new territory when it comes to technology. This paper investigates the barriers, hurdles and resistances that educators face with technology adoption in education [1].

Bridging the digital divide includes not only providing the necessary equipment and resources to ensure technology ubiquity, but also providing the learning environment that alleviates apprehension and supports teachers in technology adoption. Initial training sessions can be designed where educators explore the new technology in an informal relaxing atmosphere without the pressure of pre-approval or formal use in an academic environment. It may be helpful to transform the experience of early adoption into fun activities such as games or contests so these educators feel more comfortable, excited and confident about sharing the news technology with colleagues and other educators [2].

1.1 Significance of the Study

The significance of the study is to assess the psychological barriers to technology adoption in education. Educational technology can enhance the quality of education and improve student learning. However, there are many psychological barriers to technology adoption. It is very important to understand the psychological barriers to adopt technology in education or any kind of organization. Psychology tries to understand the human mind. Education is an extension of the mind. For extensive research on psychological barriers to technology adoption in education or any organization, it is very important to understand the key psychological concepts. There are some common and key psychological concepts, for example, perception, personality, motivation, and attitude [3]. Without understanding these key concepts, it is very hard to understand the psychological barriers to technology adoption in education or any kind of organization. The educational technology market is growing tremendously. Educational technology can enhance the quality of education [4]. Educational technology can also be used by educational organizations to provide distance education [5]. Apart from distance education, educational technology can also improve and enhance the student learning process, which in turn can improve the overall quality of education. However, despite the positive impact of educational technology on the education system, there are many psychological barriers to technology adoption in education [5]. Educational technology can only be beneficial with effective adoption and implementation. There are many studies on technology adoption in education, but very few studies focus on psychological barriers to technology adoption in education.

1.2 Methodology

This chapter follows a qualitative research design to discover the psychological barriers that are acting as resistance to technology adoption in education from the ground level and also strategies for overcoming such resistance. A descriptive approach is adopted to review and bring together related literature systematically on the basis of the dynamics of psychological factors in technology adoption, drawing on existing theories, research findings, and practical insights. The analysis will be carried out by mapping the key factors contributing to resistance from educators and students in a way that provides an exhaustive view of challenges. An analytical lens is used after descriptive analysis to probe possible underlying causes and implications through critical examination based on themes emerging from the data. This dual approach will bring out not only what has been happening with psychological barriers but also rich strategies on breaking down resistance for successful technology integration into educational settings.

2 Theoretical Framework

In any organization, there are fears about the introduction of novel technology. They might be fears about how technology would disrupt routine jobs and tasks [3]. Other fears might include concerns about technology not working properly to get the job done, resulting in lost productivity. For personal technology, there are often fears about the intrusion of technology into once private spaces (e.g., phone calls, texts, tracking location). Generally, these fears can lead to resistance to the implementation of technology. Resistance comes in many different forms, making it hard, if not impossible, to dismiss outright. Technology can be slow to be adopted, used improperly, at the wrong time or place, or rejected outright. This leads to the necessity of shedding light on psychological barriers to the acceptance and usage of technology in education. There is extensive literature on the subject of resistance to the implementation of technology in organizations [3]. An expansive field of scholarship examines the psychological barriers to implementation. Many of the models posited filter through psychological reasoning. Social processes are examined, such as distinct types of group deliberate behavior, biases, and inferences, resulting in overlooking technology's advantages, an inability to comprehend and envision the potential change, or fearing unproven tech would harm the organization's future. Outside social processes, cognitive processes are considered as would-be adopters' framing of what is proposed, such as overestimating current processes' advantages (i.e., sticking to the comfortable). Social filtering and framing processes lead to a biased and often negative perception of the proposed change. Such psychological barriers would need to be addressed in those aspiring to increase technology adoption in education, such as government officials, administrators, and other stakeholders.

2.1 Diffusion of Innovations Theory

The Diffusion of Innovations Theory, proposed by Rogers in 1962, is one of the most influential theories in the field of communication. It explains how new ideas and technologies spread within a society or an organization. Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" [6]. Indeed, there are four main components in this theory: innovations, communication channels, social systems, and the time [7]. The innovation element includes the features of an idea or object that make it new, such as its relative advantage, compatibility, complexity, observability, and trialability. Communication channels are the means through which information about the innovation is exchanged. Social systems refer to the groups of individuals who share a common culture and interact with each other. The time element involves the stages a potential adopter goes through to make a decision about adopting or rejecting the innovation.

The Diffusion of Innovations Theory is often presented in a five-stage model that describes the process that leads an individual or social system to adopt a new technology. The stages are: Knowledge: when the potential adopter is exposed to the innovation, but lacks details about it; Persuasion: when the individual forms a favorable or unfavorable attitude toward the innovation; Decision: when the individual engages in activities that lead to a choice to adopt or reject the innovation; Implementation: when the innovation is put into use; and Confirmation: when the individual seeks reinforcement for the innovation-decision and may reverse the decision if exposed to conflicting messages about it. The main issues concerning the psychology of adopting innovations revolve around the perception, the attitude and the motivation of the individual [7]. Educators interested in technology innovation and change in education may apply this framework to understand and address barriers to the adoption and use of technology in their classrooms. This theory also offers insights in ways to promote educational technology use and, for those educators who are interested, the strategy to lessen potential resistance to changes in their instructional methods [8].

2.2 Technology Acceptance Model

The technology acceptance model (TAM), which is one of the best-known models to explain why individuals accept or reject information technology [9]. Based on the Theory of Reasoned Action (TRA), Davis proposed two key determinants of system usage: perceived ease of use (PEOU) and perceived usefulness (PU). PEOU is defined as "the degree to which a person believes that using a particular system would be free of effort," while PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [10]. Users will tend to accept and use a technology if they perceive it as easy-to-use and useful.

TAM has been applied in many kinds of research settings to explain IT acceptance behavior.

The original TAM model specified the following relationships: perceived ease of use → perceived usefulness → intention to use → actual system use. Later, to explain more variance in intent to use, Al-Tarawneh [2, 7] included two external variables (system design characteristics and user training) into the TAM model to create the TAM2 model. The TAM2 model posited that perceived ease of use was influenced by perceived usefulness, subjective norm, and self-efficacy [11]. Perceived ease of use was proposed to be a more temporally proximate influence on usage intention in voluntary settings. Other variables, such as experience, gender, and age, were proposed to moderate the adoption of technology [11].

With the rapid growth of the Internet and web-enabled technologies, researchers have been investigating the acceptance of Internet technology using TAM-based models. Some of the models have integrated the dimensions of different theories into a unified model and have proposed certain variables that might have moderating effects on individuals' intentions to accept or resist the Internet. For instance, Huntington found that the internal beliefs of the individual teacher, in terms of constructivist pedagogical content beliefs, self-efficacy, interest in technology, and the individual-view teacher belief profile, as well as the social construction of the external context in which technology acceptance occurs, all have an influence on the acceptance and use of school and academic digital media technologies [12].

3 Psychological Barriers to Technology Adoption

In recent years, there has been a growing emphasis on technology in education. Internet connectivity and technological gadgets are transforming how teachers teach and students learn. The Lagos E-education project in Nigeria aims to adopt technology in education, providing pupil-computer access and school Wi-Fi. However, the success of the project depends on teacher and student acceptance of the proposed technology. Concerns include current mindsets towards technology, pupil perceptions of teaching approaches, and resistance from teachers and students. [12]. Many faculties remain resistant to integrating ICT in education due to fears of deteriorating motivation for learning and lack of consultation on technology use. Traditional teachers believe they can cover the same syllabus offline. Saboteur teachers actively work against new ideas. At Lagos State University, there are teachers and pupils resistant to almost all aspects of the e-education project.

3.1 Perceived Usefulness

A major component of teacher resistance is a perceived lack of usefulness of a new technology for classroom activities [13]. The perceived usefulness of technology

in the classroom is most validly viewed on two levels. On the first level, educators perceived the usefulness of technology as related to instructional and managerial tasks. The usefulness and productivity of undertaking instructional tasks and activities is enhanced through improved control, organization, and development of classroom interactions and behaviors. On the second level, administrators perceived the usefulness of technology primarily as related to communicating the purposes and desired goals of school technology initiatives as it applied to instructional tasks, classroom activities, and teacher concerns.

Perceived usefulness appears to be a key factor in addressing resistance to classroom technology for those categories. Awareness, knowledge, and understanding are not enough unless 'what's in it for me' is also demonstrated for the specific situation. This perception of usefulness also needs to be broad enough to include positive consequences for instructional productivity and at the classroom level. More mellow pitches and workshops clarifying the beneficial consequences of technology for instructional productivity, improved teaching, and enhanced learning opportunities should be tailored to them. Technology training addressing this need should be included in full-time programs [13].

Strategies for staff development that persist in focusing only on the technology, rather than on instruction, and that approach classroom technology in a fashion similar to the inservicing of previous educational innovations will not alter that first order resistance. Education systems' initiatives are designed to effect broad changes in the classroom. There is a true concern that the changes desired encompass the very heart of teaching itself, i.e., classroom production and the nature of classroom interactions.

3.2 Perceived Ease of Use

Perceived Ease of Use addresses the psychological barriers that individuals may face when adopting new technology in education. These barriers can include feelings of anxiety or frustration when using new technology, as well as self-doubt about one's ability to use technology effectively. Perceived ease of use refers to the degree to which a person believes that a particular technology is easy to use [13]. Individuals will perceive a certain technology as easy or difficult to use according to the consideration of several factors, including the outcome expectations, the consequences of its usage, and the effort needed for operating it, amongst others. In terms of attitude toward computer technology, a person will either like or dislike the technology according to his/her perception of how easy or difficult the technology is to use. Those who perceive the technology is easy to use will likely have a positive attitude toward it.

In order to meet the change and development of this era, it is essential that individuals open up to the use of technology and adopt it in their daily lives. Therefore, those psychological barriers need to be resolved and understood. There are generally several intentions to resist change with the appearance of new technology. Analyzing

the perceived ease of use can help to find ideas, strategies, and alternatives in overcoming the resistance thought by addressing those perceptions [14]. A technology that is perceived to be easy to use spares its users from the efforts of having to learn about it. When a particular technology is adopted, its acquisition, repair, and usage normally incur costs in the forms of time and workforce. For instance, in order to operate a particular technology, users need to learn how to use it, which may require an amount of time and money being spent on training courses. The efforts saved can be redeployed to the users' core work tasks and increase their job efficiency and efficacy.

3.3 Fear of Change

Fear of change comes from the emotional side and arises from the difficulties that educators experience in understanding and using technology. Teachers are naturally resistant to change because they fear technology, feel unsure of its capabilities and effects, and are confused by its complexity [15]. Most of them view technology as a threat to their job or a device for intensifying their workload. Therefore, it is necessary to understand the fears surrounding change because worrying about a new technology is a legitimate concern for many. To relieve this fear, it is important for technology advocates to address educators' concerns before technology is adopted. Concerns must be acknowledged, and information must be provided. Without doubt, adequate support and training improve educators' confidence levels. Technology advocates need to establish an ongoing support system for using technology in everyday educational situations. The gradual adoption of new technologies, even if it takes longer, may help institutions avoid feeling overwhelmed by change.

On the other hand, it is essential to demonstrate the benefits of new technologies. Awareness of the advantages of integrating technology in education must be raised. Educators must see how technology can assist them in doing their tasks more easily [15]. They must be convinced that new technologies will save them time and effort, and a good return on investment cannot be stressed too much. It may be a good idea to invite technologically competent teachers to demonstrate their experiences with successfully applied technology in education. Successful stories should be circulated constantly, and there should be a climate of positivity and confidence in the institution regarding new technologies always.

4 Factors Influencing Resistance

Several psychological barriers, such as fear of change, uncertainty, and lack of confidence, influence resistance to technology adoption. Understanding these factors is crucial to overcoming resistance. Lack of access to resources and technical awareness also contribute to resistant behavior. Skepticism about the expected performance

and perceived usage and usability also play a role. [16]. During the early phase of examination platform technology, users see it as unnecessary and are less willing to adapt. Skepticism increases resistance towards technology. Negative experiences also contribute to skepticism and disbelief in technology's benefits. Educators should not assume resistance is solely psychological. The solution lies in developing awareness and addressing external barriers. A proactive strategy considering both psychological and external factors is key to reducing resistance.

4.1 Individual Factors

The term "psychological barriers" refers to personal beliefs, attitudes, and characteristics that may hinder or impede taking a certain action. Numerous research studies have discussed how psychological barriers affect people's response to a wide variety of issues. This section provides an overview of psychological barriers to technology adoption in education by reviewing barriers identified in previous research studies. After discussing these barriers, this section focuses on developing strategies to address these barriers. Strategies discussed in this section include approaching resistance as natural, leveraging attitudes toward students, employing personalized training, and approaching the need for change through positive perspectives [16].

Technology beliefs or attitudes are identified as one of the primary reasons behind instructors not adopting technology [16]. Notably, both faculty and student attitudes affect the adoption of technology. Students often have more positive attitudes toward technology than faculty do. Faculty typically adopt technology with the purpose of improving student learning. Lack of perceived need to enhance learning with technology leads faculty to have more negative attitudes and feelings toward technologies. When faculty view technology adoption as merely innovative equipment used for educational practices, they tend to have more negative attitudes. Studies indicate that "perceptions of users' specialization in and attitude toward the adopting innovation segment" might significantly affect the technology adoption process in education.

4.2 Organizational Factors

Organizational Factors refer to how institutional structures, policies, and availability of technological infrastructure influence teachers' and students' willingness to adopt innovations. Considerations of faculty cohesion in schools and access to technology may also be relevant. Barriers to technology adoption at the organizational level include lack of administrative support, insufficient technological resources and infrastructure, low priority for technology in professional development opportunities, and lack of time to learn and use new technologies. A more proactive approach

of technology-organizational changes must consider how technology and organizational changes are integrated [17]. In this scenario, pro-active measures and technologies can be adopted by modification of existing work practices to fit technological constraints, e.g., changing the mode of teaching from teacher-centred lecture presentations to group work with semi-automated lectures. In the current state, organizational pressures play no role because technology is not deployed, and innovation just involves switching to another technology (with organizational changes to fit it).

There are various strategies of addressing organizational factors to resistances toward technology adoption. Suggestions include a concern for the organizational strategy and a need for organizational changes to fit emerging technologies. Faculty cohesion with other teachers in schools is the unifying element for schools that share a common culture and community. Faculty cohesion is important in influencing technology integration for student learning through students' understanding of technology funds of knowledge [17]. In contrast, social cohesion among teachers is the most influential barrier for teachers at schools with little technology availability and poor professional development opportunities. In this case, there is a stronger tendency for technology non-use at the institutional level. Strategic visions, institutional policies, and faculty priorities played a limited role because most teachers' and students' technology adoption decision-making mainly occurred at the individual or classroom level, where lack of administrative control would undermine the institutional effort to encourage the use of technology in education. Since teachers' technology adoption depends on the institutional culture and community, it is important to develop policies in aiding the development of commons spaces for teachers (both online and at schools) to engage in dialogue and collaboration around technology adoption. In particular, there is a need to create a community of teachers exploring practical technology uses for student learning, including demo/pilot experiments with new technologies tested by teachers before class-wide adoption and co-design of educational materials [18].

4.3 Societal Factors

This broader perspective also emphasizes the need to examine external societal factors that may exert influence or pressure on individual behavioral intent and willingness to adopt new technologies. These could be wider community or national cultural norms or concerns, political structures, and economic issues that may mean that for certain personal circumstances, technology adoption is much less appropriate or is seen as impractical. Individuals anywhere are increasingly being coerced into adopting technologies much faster than they may be felt to be culturally or socially appropriate. Greater attention should be paid to the externality pressures for technology adoption and the relationship of technology adoption with wider societal issues in addition to solely focusing on the factors most directly relevant to the individual person or group [18]. The significance of educational level and direct social exclusion should also be recognized as being able to exert the opposite and

discouraging influence on one's intent to adopt new technologies at all. For many within countries with established technologies, an unquestioned ability and willingness to adopt are assumed and inquiries and initiatives proceed from there. However, for others, especially within less developed rural societies, technology adoption is a much more complex and difficult issue. Even and also where there are many beneficiaries from technology adoption, those who do see the benefits may still be excluding whole sections of the community. Very important questions about technology adoption and social exclusion, and hence the limitations of benefit from it, need to be addressed [18].

5 Strategies for Overcoming Resistance

Psychological barriers apply to all educators in their roles as both instructors and learners [18]. The decisions to change or resist technological integration are influenced directly by an educator's perceptions and beliefs. These are often driven by fear, either real or perceived. An individual may feel less threatened by this fear if they are unaware of the fears that motivate their thoughts about technology. Fearing change and not being able to see the options available is understandable. The perceptions of change can be considerably different depending on the experience of the person viewing the changes. Established educators may view the adoption of technology through a lens of skepticism, having heard one proposal after another become the latest fad that will pass with time. Often, experienced educators have adopted and ruled out many different methods and philosophies of change in the classroom. Each of these has left its imprint on perceptions of current changes in curriculum and teaching methodology. Familiarity with technology integration and previous change proposals pervade how existing instructors perceive changes in education. Conversely, those who have known only education as a technological environment may never have considered doing things differently or seen the many valid reasons not to adopt technology and its associated changes [19].

5.1 Professional Development and Training

Professional development and training have been shown to be vital in reconsidering school cultures to support sustained learning with technology. Harnisch, Comstock, and Bruce found that the development of professional learning communities providing formal and informal interactions with peers and experts in the field provided the scaffolding for the use of new technologies to support student achievement [19]. they concluded that professional development was most effective when it took place over an extended period and focused on specific curricular needs. Harnisch, Comstock, and Bruce described how schools must rethink the nature of

professional development to build communities that engaged educators in sustained school-wide efforts to integrate technology into their teaching [19].

In their study of five grant-funded projects aimed at building professional learning communities, they stated that the informal safe space for sharing ideas provided by peer networks was a powerful support for teachers' learning and fostered mutual learning and teaching among members. Outside of the formal classroom setting, participants met with their peers to discuss their experiences and reflect on their learning. Similarly, it was found that teachers' use of technology increased significantly when they participated in a one-to-one laptop initiative offering intensive collaborative support [19]. Learning in context, such as both formal and informal PLCS, can engage individuals in actively working with others on challenges and goals within their professional practice.

Though almost all educators reported that their school district required technology training, that training appeared to be geared mostly toward administrative uses. Only slightly more than half of the educators felt that they had adequate preparation to integrate technology into instruction. Educators were invited to consider technology not as a supplemental teaching tool, but as essential [20]. It was also concluded that the likelihood of technology integration was not the result of one factor but was the combination of all factors [20]. However, having technologies did not guarantee integration. RMS teachers have access to technology, so other factors must be contributing to the lack of high-level technology integration.

5.2 Change Management Strategies

Change management strategies are a critical component in ensuring the successful implementation of any new technology across an organization. Consequently, a variety of tactics and approaches have been suggested to address resistance to this change. Each organization needs to assess the problems it is facing in integrating new technology in order to gauge the feasibility of these solutions. Even within a single organization, different cultural attitudes towards technology may exist, so an immediate one-size-fits-all answer to this dilemma may not be ideal. Computing departments too often view provision of new technology as the element of their jobs that is geographically easiest and most comprehensible, and leave it to faculty to decide whether to adopt this technology or not [20]. The technology, however, frequently necessitates a significant pedagogical shift, in which faculty cannot be left without support. Faculty must first be convinced that need exists for this technology understanding of the benefits from it, and these benefits cannot be simply pedagogical; they should improve on campus computing system, and perhaps even the composition of that system on their home university. The technology must also be made easy for faculty to access.

Electronic mail and similar innovations can be used to implement this change mechanism. New programs such as Listserv and Notes allow the creation of low-tech and low-look forums for discussion of technology issues. Faculty new to this

forum might be astounded both by the depth of questioning from the technology resistant and by the willingness of the technology advocates to discuss publicly mistakes made, and miscalculations anticipated [21]. New information cascades down not just to the editorship level, but importantly to junior faculty and staff who might be intimidated by traditional avenues of communication [22, 23]. Of particular importance is deft handling of evaluative concerns, which if unchecked on a public forum might damage not only the credibility of faculty attempting to address these concerns, but also the educational process as a whole. Up-front systems can easily misinterpret certain concerns as technological or academic frauds, when they should be viewed simply as unusual side effects of invoking a method previously outside institutional pedagogy. An appropriate intervention is at least informing the concerned faculty how their concerns are being received. Under a technology system that no one understands, reprimanding or otherwise seeking to discipline these faculties might be interpreted as abusive or tyrannical. Under a technology system that no one understands, reprimanding or otherwise seeking to discipline these faculties might be interpreted as abusive or tyrannical [24, 25].

5.3 Creating a Culture of Innovation

A critical first step in the change process is the establishment of collective identification of needs or problems that support innovative technology as part of the solution [21]. Subjective perceptions of the realities of daily tasks create an expectation gap: a difference between perceived "as-is" and perceived "to-be" situations or practices. Foster an atmosphere of openness and creativity as part of a drive for innovation. This could include simple tactics such as social activities and informal gatherings, but should also extend to curiously focused "walks on the wild side" where teachers and students experience together alternative practice in different environments. Encourage educators to try out new ways of doing things and reflect upon their experience. Potential strategies include provision of resources such as new devices on trial; creating time, space and support for experimentation; invitation to high-profile teachers to showcase radical innovations; and allowance of failure and return to previous approaches if desired. Ensure student collaboration is an expectation for technological innovation initiatives. Insights from the end-user perspective are invaluable, and students are likely to be more daring and energetic in experimenting with new technologies. Student participation might also be necessary for ideas introduced by educators to gain currency among the student body [21].

6 Case Studies

To illustrate real-world experiences of educational institutions in overcoming resistance to technology adoption, six case studies are presented: two focusing on students taking control of their own learning through technology adoption; a third highlighting teacher preparation for the use of technology in classrooms; and three exploring professional development with mentors, coaches, and school leaders to encourage enhanced use of technology in classrooms. The last three cases address barriers in broader cultural considerations [5]. Concluding recommendations build on the case study insights regarding strategies for broadening adoption of technology [26].

Two elementary school case studies are described in which integrated-use technology initiatives were rolled out at one school each in a large, urban public school district. In both cases, while technology budgets were similar and both schools received the same treatment for professional development, support for broader adoption of technology varied greatly because each school's climate, culture, and past experiences with technology were distinctly different. The case studies illustrate how understanding and addressing the broader conditions and deeper cultural issues schools face with technology integration provide insights into how to best support greater use of technology in classrooms. A set of standard questions for leaders, including administrators, technology coordinators, and district staff, is provided as a guide to assessing and addressing local conditions. Addressing these standards may help ensure positive technology adoption and integration [26].

This case study focuses on vital elements of effective teacher preparation in the use of technology. It describes an exploratory study within a Northeastern university's graduate teacher education program that investigated the views of selected faculty and student teachers about preparing teachers to use technology in K-12 classrooms. A discussion of relevant studies foreshadows an overview of the program, research methodology, participant profiles, and findings. Includes practical recommendations for improvement.

The 2nd International Conference on Pedagogy, Communication, and Language Education 2018 focused on technology adoption in education, particularly psychological barriers. It was suggested that schools need a plan for resource management, teacher support, ongoing professional development, and program monitoring to promote the use of technology [26]. A case study explores technology adoption in an alternative middle school. Despite its potential, technology is currently underused in K-12 schools, according to Durff and Carter. Technology integration is expected to enhance student achievement. The process of technology adoption is challenging and time-consuming. This study examines a middle school alternative education program in a large school district, which closed twenty-one elementary schools and implemented a gifted and talented magnet program to improve performance on state tests and avoid sanctions. Understanding how stakeholders perceive instructional technology is crucial for effective implementation [26, 27].

7 Conclusion

This study examined the psychological barriers to technology adoption in education and examined how educators coped with second-order barriers. The research provided insights into specific aspects of cognition and attitudes toward technology use, illustrating the coping strategies some educators used to develop positive beliefs regarding technology integration for meaningful learning experiences. The findings stimulated consideration of strategies to mitigate or prevent the development of negative beliefs regarding technology use. Some of the implications of this study highlighted how educational leaders who wish to influence the development of educators' beliefs regarding technology integration might reframe the ways educators experience technology. Forcing technology on educators is ineffective. To influence beliefs about technology in classrooms, stakeholders must understand educators' individual situations. This can be achieved by gradually introducing technology, modeling its use, providing access to technology, and encouraging collaboration. Creating a culture that promotes technology integration is also important. This study explores teachers' perceptions of barriers to technology use, including psychological factors such as self-confidence, resistance to change, and low expectations. It also offers insights into coping strategies for overcoming these barriers.

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Digital Tools for Teaching Arabic: A Comparative Study of Traditional and Modern Approaches



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Abstract It compares traditional and modern approaches to teaching Arabic through the integration of digital tools in language instruction. In terms of methodology, it is a qualitative study that takes a descriptive approach by reviewing available literature regarding both traditional and modern methodologies and their effect on teaching the Arabic language. The research synthesized findings from theoretical frameworks and empirical studies with respect to how digital tools can enhance the effectiveness of teaching compared to traditional methods. Results give implications for researchers and policymakers about how digital tools can be used to improve teaching outcomes, engage students, and make the teaching process more individualized according to learners' needs. In brief, this research adds weightage regarding ongoing discourse on educational technology within the sphere of Arabic language instruction; it also provides suggestions on practical issues related to integrating digital tools into language teaching.

Keywords Digital tools · Arabic language instruction · Educational technology · Modern teaching approaches

1 Introduction

The following is an overview of the research in the first section of this paper concerning digital tools for teaching Arabic, with comparisons between traditional and modern methods, purposes and significances of studies, research questions, methodology, and organizational structure of papers that provide a brief preview of upcoming sections. The use of digital tools in language teaching has been proved to impact academic processes as well as cognitive outcomes among students based

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on the integration of an interactive program for non-native Arabic speakers, which helped in improving the learning outcome [1]. Another study that focused on the evolution of computer applications in language education from the perspective microcomputers used to teach Arabic grammar affirmed work being realized about progress and prospects on educational technology toward applications for language learning [2].

1.1 Background

The development of technology in teaching Arabic has become very important and that it has the potential for better efficiency in teaching the language. In countries like Kuwait, the availability and usage of instructional equipment and materials are found to vary from one school to another; there is a general lack of knowledge among teachers about how to use or maintain equipment [2]. This would be a considerable impediment to the large-scale propagation of computer-based methods of teaching Arabic language learning. Nevertheless, the development of computer applications in teaching has opened up prospects for revolutionary change in language education by offering learners interactional and authentic material. The use of NLP tools and corpora pedagogically indexed has started being experimented as a method for teaching Arabic by which it will allow educators to create activities according to different pedagogical situations or even pedagogical setups for similar tasks [3]. This approach not only helps to get a real impetus and motivation on the part of the students but also promotes the development of self-learning strategies and self-confidence. The computer-based approach of learning languages enhances authenticity in providing access to authentic materials and interactions with native speakers.

1.2 Research Objectives

The research objectives of this study comparing traditional and modern approaches to teaching Arabic using digital tools are to assess the effectiveness of instructional materials in enhancing Arabic language teaching for non-Arabic speakers and to evaluate the impact of advanced interactive e-learning methods on developing language skills. The study aims to address specific questions such as the provision and use of instructional materials in Arabic language teaching programs and the effectiveness of interactive e-learning tasks in developing listening, writing, reading, and speaking skills. Additionally, the research seeks to explore the utilization of smartphone applications, audiobooks, and interactive online platforms in promoting student interaction and engagement in language learning processes. These objectives provide a clear framework for the study's methodology and analysis, contributing to the advancement of effective Arabic language teaching strategies.

1.3 Methodology

The methodology for this research is basically of a qualitative in nature. A descriptive approach will be used by the study to carry out a complete review of the literature, both theoretical frameworks and empirical studies, related to traditional and modern teaching methodologies for Arabic language instruction. The research seeks through an extensive review of the literature to identify and analyze the differences, similarities, and outcomes associated with traditional as well as modern approaches. In synthesizing findings from review of literature an analytical approach is adopted that helps extract key insights and trends; this facilitates a critical examination of the effectiveness of various digital tools in comparison with traditional methods, thus giving a holistic understanding of their impact on teaching Arabic language. These will form part of what results and discussions have for educators and policymakers seeking to enhance Arabic language instruction through the integration of modern digital tools.

2 Theoretical Framework

The theoretical framework for the comparative study of traditional and modern approaches to teaching Arabic using digital tools is informed by key concepts and principles in educational technology and language learning. It was emphasized that the importance of utilizing science and technology in teaching, highlighting the application of computers in language learning, as well as the challenges that pertain to implementing instructional technology with specific reference contexts such as Arabic language education [4]. This relates to the need to comprehend the utilization of digital tools in teaching Arabic plus potential barriers that stand against their widespread applications. Furthermore, it was underscored the significance of developing intercultural communicative competence (ICC) in the Arabic curriculum; this underscores definitional importance: indicators are important for aligning curricular goals to foster informed global citizens [5]. The findings also have an implication on emphasizing needs regarding improvements in organization plus selection of topics in the Arabic curriculum: it provides insights that are guided relatedness towards evaluation aspects of traditional and modern teaching methods. These references help to define the theoretical framework by offering insights into problems and possibilities of teaching Arabic and ICC development, which are core components of the comparative study.

2.1 Overview of Language Teaching Theories

Theories of language teaching range widely, from traditional to technological. Behaviorist, cognitive and communicative CALL have evolved over time with different phases as a result of the contributions of various learning and teaching theories and later multimedia and internet technologies in integrating skills in language instruction [5]. The evolution of computer-assisted language learning (CALL) software has critically influenced language education; distinct stages are Communicative CALL, Structural CALL, Integrative CALL having roots from behaviorist to communicative approaches then multimedia now internet technologies in integrating skills for practical use within language instruction. The use of developed technology (such as the Internet) has proved to improve self-learning strategies for languages and also make them more authentic in terms of exposure to learners. The synthetic nature due to its morphology, diglossia phenomenon presented by Modern Standard Arabic (MSA) non- coexistent with Non-Standard Arabic (NSA) makes Arabic language teaching pose unique challenges Arabic is characterized by having a complex morphological system and being significantly different from Indo-European languages [5]; therefore, an in-depth knowledge of language teaching theories is required to be able to analyze the appropriateness of digital tools for teaching Arabic according to any of the theories.

2.2 Advantages and Challenges of Traditional Teaching Methods

There are several advantages of teaching Arabic with traditional methods. For example, the direct interaction that takes place in the classroom between students and teachers provides a way of personalized guidance and immediate feedback which can make learning more favorable. Additionally, memorization is closely tied to many traditional language-teaching approaches as well as immersion in the target culture: two components essential for successful language acquisition and understanding cultural context (cuisine, music, traditions) related to the language. On the other hand, these methods may prove challenging since students might not have adequate resource access and due to a potential lack of engagement: some instructors could be using only classic ways of teaching without integrating modern technological tools or media that would help support effective learning [6]. Such an approach leads to uninspiring lessons lacking student interest or motivation—which would have an impact on their achievement when studying how to read and write in Arabic.

2.3 Role of Technology in Language Learning

Technology in language learning—with a keen interest in teaching Arabic—is multifaceted. The use of modern digital tools can be highly engaging and offer an interactive experience, which helps in providing a variety of authentic resources for language learners. As noted by [6], there are challenges because technology must be aligned with pedagogical and methodological shifts that bring about change in the ways teachers work. Educators need to realize the connection between learner-centered practices that lead to good learning outcomes when integrating digital tools into language teaching. Even though technology can help improve proficiency in Arabic, we need to address the issue related to the stubborn nature of existing methodological beliefs and pedagogical practices, which might impede effective technology integration within language classrooms.

3 Traditional Approaches to Teaching Arabic

Ways of teaching Arabic traditionally included Qira'ah (reading), Terjemah (translation), Menghafal (memorizing), Insya' (composition), and Imla' (dictation) [10]. These are teacher-centered, rote-memorization techniques involving direct interaction between the teacher and student based on a manual of Arabic grammar rules. The increasing role of technology in educational settings has shifted the earlier stand-alone style of learning towards embedding Information and Communication Technology (ICT) tools within the language content, which is an evolving trend. Computer-assisted language learning applications are gaining popularity in today's teaching environments–for instance, a CALL task lets learners interact with texts that have been pedagogically selected independent of any facility for self-instruction or for interaction with native speakers [6].

3.1 Grammar-Translation Method

The Grammar-Translation Method, in its approach to teaching Arabic, has had analogies with modern digital tools and techniques. This method historically focuses on teaching grammar and translation within the Islamic educational tradition. Scholars like Ibn Khaldun would have opted for a more communicative approach to language teaching, putting much value on direct contact with the language and reading for learning as is here indicated by "incorporation of reading in the process" [7]. Furthermore, the utility of translation in foreign language teaching has been emphasized by researchers such as Halliday, Widdowson, and Nation who bring out the functional role that students' mother tongue plays in providing access to explanations, enabling contrast between languages, and helping with the acquisition of lexis [8]. These

considerations throw light on both the historical-pedagogical underpinnings of the Grammar-Translation Method and its advantages/requirements for use.

3.2 Direct Method

The direct method is a teaching approach that assigns primacy to the use of the target language in the classroom through such means as vocabulary, dialogue, rules explanation, writing, questioning, and exercises. It is prominent in Arabic teaching at Al Ishlah Institute for Girls Lamongan across various religious subjects with specific emphasis on Arabic language paper. Another aim of the direct method according to Professor Rusydi Ahmad Thuaimah's theory is making students think in Arabic rather than in their mother tongue and apply direct immersion while teaching Arabic grammar of expressions and sentences as well [9]. Also researched was the applicability of the direct method toward speaking skills; this study concerned its contribution to making students capable of speaking Arabic fluently. The study underscores the importance of applying the direct approach to improve students' speaking skills and its relevance to practice in language education. With the constant evolution of digital tools, their use to integrate the direct method when teaching Arabic would be another way of supporting and even further enhancing a modern classroom learning experience.

3.3 Audio-Lingual Method

The Audio-Lingual Method is characterized by a number of key principles: instruction in the target language, teaching of language forms within a context, minimizing native language interference, and use of native-speaker models [8]. Moreover, it stresses the freewheeling practice of error avoidance, reinforcement–both positive and responsive to verbal and nonverbal stimuli–and teacher as a conductor with great emphasis on foreign language learning parallel to mother tongue. Drills used by this method include memorization of dialogues as well as repetition, transformation-substitution, and question-answer drills; also included are minimal pairs and grammar games. In his work with others [9], Mohamed et al. propound an Arabic CALL system for computer-aided language learning of Arabic using Natural Language Processing techniques. The following is in connection with the use of pedagogically indexed corpora for this approach, to create activities based on adapted texts, giving a pedagogue the possibility of developing activities that are completely adapted to their pedagogical context through a platform ARAC. The technology, namely the Internet involved enables autonomous learning and then self-assurance of learners by offering authentic language communication with mother tongue speakers very naturally [9]. These up-to-date digital tools help develop language skills within authentic environments, which also fosters general learning.

4 Modern Approaches to Teaching Arabic

4.1 Communicative Language Teaching

The Communicative Language Teaching (CLT) is believed to be an effective approach toward communicative competence and the development of language skills. The main principles CLT tries to emphasize are promoting a student-centered classroom that will allow authentic communication through comprehensible language input. Teachers are encouraged to design learning tasks with clear objectives, based on learners' needs that will foster interactive use of the language. But, as reported by several studies involving EFL teachers, implementation of CLT within Arabic second language teaching context does present challenges [10]. Indeed, challenges such as noted in several studies involving EFL teachers: large class sizes, varying student proficiency levels, and lack of training resources have been identified as hindrances to the effective implementation of CLT in ESL classrooms However, even if the integration of AMs in CLT poses these challenges, it has been found to be one approach that could further enhance the students' communicative competence. While there are many advantages to adopting a communicative approach in teaching Arabic as a second language, educators need to recognize specific challenges that will accompany its implementation within this context.

4.2 Task-Based Language Teaching

Task-Based Language Teaching (TBLT) is an important approach in language education that focuses on using tasks as the primary unit for language learning and teaching. TBLT consists of three main phases: pre-task, during-the-task, and post-task, with each having its preparatory, task-based, or reflective function. The during-the-task phase involves group work and formative assessment [11]. The post-task phase incorporates assessment exercises with language focus activities to ensure the development of language skills and competencies. The pre-task bridges the language gap between any two tasks set to be achieved and at the same time giving students a foretaste on some specific objectives set by a given task while allowing the teacher to reuse what was taught previously in order to test comprehension of students later as they perform meaningful activities in authentic r TBL tasks create real-life language environments within classrooms-in which learners communicate collaboratively through meaningful tasks. An analysis of digital tools integration into TBLT when teaching Arabic reveals that there are both advantages and challenges. Even though the integration of digital tools can improve task design, create opportunities for language use and collaboration and facilitate peer learning, attention needs to be given to the provision of technological access and training as well as pedagogical alignment for effective integration [11]. The use of digital tools in TBLT is about creating authentic

language tasks, supporting student interaction, and giving formative feedback that ultimately improves Arabic language teaching under the principles of TBLT.

4.3 Content and Language Integrated Learning

Content and Language Integrated Learning (CLIL) is an innovation in language teaching that emphasizes integrated language learning with the development of content [12]. Therefore, in the context of Arabic language teaching, CLIL would offer a vehicle for teachers not only to keep developing their language teaching skills but also to effectively develop content. The research found that CLIL has highly influenced language teaching: 21 out of 30 teachers agreed on the positive impact of CLIL on English Language teaching [13]. In the implementation of CLIL, it should be noted that the role of a content teacher is not merely policing the language but facilitating its use for academic purposes as well. This also reflects a move from instructional to participative classes where students obtain content understanding through manipulation and use, encouraging student-student interaction through cooperative and collaborative work. Moreover, the relationship between content, communication, cognition, and culture is very important for CLIL. This leads to a re-examination of the 'centredness' in classroom teaching with an added dimension on 'thinking-centered' approach [13].

5 Digital Tools in Language Teaching

The integration of computing tools in teaching has played a very major role in changing the entire context of education, including the teaching and learning of Arabic. This movement from traditional approaches to more modern ones, it must be noted, has been caused by the infusion of computers into the art of teaching [14]. The use of computers in learning languages had seen different stages since its inception, and currently, there is CALL software that has made considerable advancements. One other advantage that comes with using digital tools in Arabic language teaching is the possibility of creating activities based on pedagogically indexed corpora, which gives room for teachers to customize materials for particular pedagogical settings. In addition to that, the use of computers can help to bring out the genuineness of language by giving students an environment where they are able to see native speakers interacting in Arabic, hence acquiring the language and gaining self-confidence. The emergence of these developments drives home the point on using digital tools in teaching languages, Arabic not left behind, as they create avenues through which the efficiency of language learning and teaching can be better realized.

5.1 Benefits of Digital Tools

The teaching of Arabic may be greatly enhanced by the use of digital tools, which make the learning experience more interesting and engaging from a student perspective. These tools allow access to a broad range of authentic language materials that support personalized learning and are tailored to the language proficiency levels of students. Educators, on their part, can monitor student progress with these digital tools while using them for collaboration and making the teaching environment more interactive and dynamic. It was stressed on the value of authentic material inclusions in the curriculum and thus on the need for adaptation of these materials to suit the target group's needs [15]. In another area, focuses on computer-assisted language learning (CALL) software impact, stressing technology's capacity to enhance language authenticity and promote self-learning strategies for students to build their language skills and self-confidence in turn [16]. These findings confirm that there are numerous advantages resulting from integrating digital tools into Arabic instruction since such an approach significantly fosters effective learning by both parties: educators as well as learners.

5.2 Types of Digital Tools

Different digital tools can be adopted in the teaching of Arabic, with each tool having its own specific positive impact regarding language acquisition and educational outcomes. Learning software has shown to improve students' results: it promotes self-confidence in language learning [17]. Mobile apps created for language learning provide flexibility for learners and an opportunity to practice Arabic at any moment or place. Online platforms and virtual reality programs provide immersive activities by allowing learners to engage with native speakers as well as real language content, hence enhancing the authenticity of the language learning process. These digital tools enable practical implementation based on different levels of language learners and cater to individual differences through self-learning opportunities, personalized learning experiences. The incorporation of such digital tools in teaching Arabic has proven efficiency as well as effectiveness in promoting the academic process; cognitive outcomes among students.

6 Comparative Analysis

It compares traditional and current approaches to the teaching of Arabic with the strengths and weaknesses of both ways, providing insight into the most effective means of teaching Arabic during this digital era [17]. It goes deep into information technology in education, stressing that science should be merged with arts while

teaching. And also the problems that accompany the maintenance and usage of modern instructional materials like video language laboratories in teaching Arabic language [18]. The chapter is a rich source of information on how to use computers for language teachers and why digital tools have to be effectively used in language teaching.

When we compare the traditional and modern approaches to teaching Arabic with digital tools, several key criteria come into the picture. They are engagement, interactivity, accessibility, and learning outcomes as the major factors that underpin any analysis of the effectiveness and efficiency of different teaching methods. The utilization of digital tools can create enhanced engagement via interactivities, immediate feedbacks and multimedia resources that could lead to higher motivation and better understanding of concepts [18]. On the other hand, the accessibility of digital tools allows learners to reach materials and resources at anytime from anywhere; this in turn fosters learner autonomy which is self-paced learning and also flexibility. Attributions make an evaluation of learning outcomes in terms of mastery of content, student behavior and self-confidence—which is important to understand the impact created by both traditional as well as modern approaches while teaching Arabic using digital tools. Further, the use of pedagogically annotated corpora and NLP tools for Arabic language learning, discussed in the work of Mohamed et al., shows the potential of text-based approaches to generate adapted tasks that are based on adapted texts and hence on specific pedagogical contexts [19]. This emphasizes that when integrating digital tools into language education, we need to take into account their pedagogical reasoning and educational affordances.

It then follows that we will be carrying out an exploration of several case studies that have at their core the comparison of traditional teaching approaches with the use of modern digital tools within the frame of Arabic language teaching. One study conducted in the State University of Malang, Indonesia, revealed that the Arabic Language Teaching Program has various instructional materials such as recording gadgets, cassettes, overhead showing material, video and language laboratory [20]. Then study found 75% of the participants to have shown keen interest in using instructional materials which enhanced student interaction with learning and made the procedure more effective. Another study introduced an Arabic CALL System based on pedagogically indexed text; this served to show some advantages stemming from NLP tool deployment for Arabic learning [21]. This approach enables teachers to prepare tasks based on the adapted text to concrete pedagogical conditions, thus providing an authentic character of speech production in the process of learning a language and increasing learner self-esteem. In this study, it was revealed that CALL software plays a facilitating role in giving learners opportunities to get involved in independent work on acquiring material of a developing language and trains them in methods of such work [22].

7 Conclusion

The comparative analysis of the traditional and modern approaches to teaching Arabic is a great contribution to see how much usefulness of using digital tools in teaching Arabic might be. According to the perceptions, they can explain many features and aspects of variables that are not testable. For instance, use of digital tools may have an effect on enhancing teaching effectiveness by providing various instructional materials: such as interactive exercises, multimedia resources, and online platforms for language practice. In addition to this, in the integrated skills approach: it is important that context and specific needs of students be taken into consideration when integrating Arabic in English Language Teaching as demonstrated by English teachers from the United Arab Emirates. These insights force educators to reflect upon their methodology with regard to the use of digital tools as well as language instruction for optimal learning experience for students.

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Criminal and Digital Protection of Patent Rights: A Comparative Legal Analysis



Omar Al Makhzoumi and Mohammed Taher Mohammed Saleh

Abstract The significance of legal protection for patents cannot be overstated for multiple reasons: innovations play a crucial role in revitalizing both national and global economies, and such protection incentivizes inventors to seek out new advancements, thereby fostering progress, development, and enhancement across various life domains. In the realm of comparative law, legal safeguards for patent rights include civil, criminal, procedural, and digital protections. This research concentrates on the criminal and digital aspects of patent rights protection from diverse viewpoints. The central issue of this study is evaluating the sufficiency of legal provisions concerning criminal and digital protections in defending patent rights against the multitude of infringement types. We employed both descriptive and analytical methods for our investigation. Our analysis covered criminal activities affecting patent rights, such as patent imitation, attempts to violate patent rights, and associated criminal liability, along with the influence of digital technologies on patent safeguarding. As a result, we arrived at several conclusions and suggestions, the most notable being that an invention receives legal protection only from the moment it is registered. A prominent recommendation is to create a specialized judicial chamber within standard courts to handle intellectual property matters, including those pertaining to patent rights, while emphasizing the incorporation of digital tools and technologies.

Keywords Criminal protection · Digital protection · Patent rights · Intellectual property · Comparative law · Patent infringement · Legal provisions · Innovation · Technology integration · Judicial chambers

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1 Introduction

A crucial element of the intellectual property rights framework is patent protection, which acts as a vital motivator for inventors to persist in sharing their creative concepts and advancing technological progress. This protection provides inventors or their legal heirs with the authority to challenge any violations of their inventions, allowing them to impose penalties and sanctions on those who infringe. It is essential for all individuals to honor the rights of inventors and avoid any infringement on their patented creations, whether by imitation or unauthorized usage.

It is significant to recognize that the extent and characteristics of patent legal protection differ based on comparative legislation, covering various dimensions of safeguarding. For example, this protection might encompass criminal measures, which impose penalties for violations of patent rights, as well as preventative strategies designed to avert infringements and actively defend inventors' rights. Furthermore, civil elements of protection may permit inventors to pursue damages or injunctions in civil courts to stop the unauthorized use of their inventions.

The evolution of technology presents fresh challenges for the protection of patents, demanding a more sophisticated legal approach. As we navigate the digital era, the rise in patent rights infringements facilitated by advanced technological methods highlights the need for legislative adaptations that consider digital dimensions. This scenario emphasizes the necessity of incorporating contemporary technologies for the monitoring and safeguarding of patents, including the utilization of artificial intelligence and digital analysis tools to identify infringements and violations.

This study focuses on the criminal protection of patents within comparative law, particularly emphasizing its technological and digital aspects. It is structured into four primary sections. The initial section evaluates the different types of actions deemed infringements on patent rights and the legal responses to these violations. The second section delves into the definition of patent imitation offenses as outlined in comparative legislation and examines the application of laws to combat this form of infringement. The third section investigates attempts to commit acts that violate patent rights and the legal frameworks established to address these attempts. Lastly, the fourth section looks into the criminal liability linked to patent infringements, detailing the penalties and processes for managing such offenses. By conducting this study, we aim to offer a thorough perspective on the protection of patent rights within the context of comparative law, while considering the most recent technological advancements influencing this area.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the criminal protection of patents by examining criminal offenses and how they are dealt with in the laws of Jordan, Egypt, and the United Arab Emirates.

- Compare penalties for patent copying crimes and assess their deterrent effectiveness.
- Study how the law deals with crimes of attempted patent infringement.
- Compare criminal and civil liability related to patent protection.
- Provide recommendations for improving legislation related to criminal protection of patents.

1.2 Methodology

To accomplish its goals, the study utilizes a descriptive-analytical approach. Initially, data was gathered from multiple legal resources, including laws and regulations concerning patent protection in Jordan, Egypt, and the United Arab Emirates. This data was subsequently employed to describe and analyze the legal frameworks and texts related to crimes of patent imitation, along with the associated penalties. Furthermore, a comparative analysis of the legislations from the relevant countries was performed to pinpoint strengths and weaknesses, as well as to evaluate the effectiveness of penalties in deterring criminal behavior.

2 Criminalized Acts Affecting Patent Rights

Legislation across various jurisdictions identifies specific actions deemed criminal in relation to patents, including the replication of a patented invention, providing false information to create the impression of having secured a patent, possessing a patented invention with the intention to sell or offer it for sale, and importing counterfeit items of a patented invention that is still under legal protection. Different legal frameworks detail these actions along with their respective penalties. In Jordan, Article 32 of the Patent Law specifies the criminal acts and outlines the associated penalties within the same article. Likewise, in Egypt, the Intellectual Property Protection Law's Article 32 defines these actions, while Article 62 of the Federal Law on the Regulation and Protection of Industrial Property in the UAE delineates them.

Comparative legislations create a broad rule that encompasses all types of criminal activities violating the rights of patent holders. They empower patent holders to initiate legal action against anyone who utilizes their invention without authorization. Additionally, patent holders are entitled to seek damages from individuals infringing on their patent rights without consent, regardless of whether they are the main perpetrator, an accomplice, a supporter, or an instigator of such actions. This feature sets Jordanian legislation apart from that of Egypt and the UAE, as the latter two do not specify penalties for attempts to carry out the crimes outlined in the law. In contrast, Jordanian legislation equates the punishment for accomplices, helpers,

or instigators with that of the primary offender. Article 32(b) articulates: "The provisions of paragraph (a) of this Article shall apply to the attempt to commit any of the acts specified therein or to aiding or instigating the commission of such acts" [1].

3 Patent Imitation Crime According to Comparative Legislation

Patent imitation involves the creation of something that falls under a granted patent, which can include either the production of new items or the replication of the manufacturing process for that item. The accuracy of the imitation is irrelevant; what matters is that the patent is replicated without the consent of its owner [2]. For a crime of patent imitation to be recognized under comparative legislation, the act must infringe upon a patent that remains active, indicating that the patent's duration has not lapsed. Furthermore, comparative legislation stipulates that the imitation must occur without the inventor's awareness or approval. Consequently, if the patent holder has given consent—either explicitly or implicitly—the crime cannot be said to exist. The imitation must also be pursued for commercial or industrial objectives, with the perpetrator intending to replicate the patent, as bad faith is a requirement for this offense under comparative law. However, it is important to note that comparative laws do not provide a specific definition for the crime of imitation. Legal experts characterize patent imitation as the reproduction of the patented invention, regardless of whether the reproduced product is an exact copy of the original or bears significant resemblance to it [3, 4].

3.1 Elements of the Imitation Crime

The crime of imitation, according to comparative legislation, only occurs when two elements are fulfilled: the material element (Actus Reus) and the mental element (Mens Rea).

- **Material Element**: This involves the act of imitation, where a patented invention is copied without the permission of the patent holder [5].
- **Mental Element**: This pertains to the intent of the person committing the imitation.

The elements outlined in comparative legislation are defined as follows: Article 32 of the Patent Law by the Jordanian legislator states that "anyone who commits any of these acts with bad faith shall be punished by imprisonment" [6]. In Egypt, Article 32 of the Intellectual Property Protection Law specifies that "anyone who imitates for commercial purposes, knowing of the patent, shall be fined" [3, 7]. According to Article 62 of the UAE Federal Law, "without prejudice to any more

severe penalties under another law, anyone who imitates a patent or intentionally infringes on any rights protected by this law shall be punished by imprisonment" [8]. In Jordan, if an individual is found to have imitated a patented invention for commercial or industrial purposes, the penalty includes imprisonment for a duration of no less than three months and no more than one year, or a fine ranging from 100 dinars to 3000 dinars, or both [9]. Conversely, the Egyptian legislator enforces a fine between 20,000 and 100,000 Egyptian pounds [10]. The UAE legislator stipulates either a penalty of imprisonment or a fine ranging from 5000 to 100,000 dirhams, or both. When examining these texts, it becomes clear that the penalties established by the legislators of Jordan and the UAE serve as a stronger deterrent for the offense of imitation compared to those set by the Egyptian legislator. Nevertheless, the UAE legislator has not defined a specific term of imprisonment for this offense, instead allowing the judge to determine the duration based on general principles.

For the crime of patent imitation to occur, comparative legislation requires the following conditions:

1. The imitation must involve a patented invention.
2. The imitation must be of a patent that is still in force.
3. The imitation must be for commercial or industrial purposes.

3.2 The Crime of Selling, Holding for Sale, Offering for Sale, or Importing Counterfeit Products

Legislation on comparative law does not merely regard the imitation of a patented invention as a criminal act subject to penal sanctions, as previously noted. It also makes illegal the sale, possession for sale, offering for sale, trading, or importing of counterfeit goods associated with the invention. Consequently, these laws stipulate that the counterfeit items must pertain to an invention that has received patent protection, and that their sale or offering for sale is intended for commercial purposes as outlined by commercial law. The act of merely offering the product for sale is sufficient to constitute this offense, irrespective of whether the product is ultimately sold, and regardless of the venue of the offer—be it a private or public commercial setting or a fair—as long as it is made available for sale in a location open to the public. This encompasses instances where product samples are presented to the public or where the items are promoted through various media channels or online.

The act of importing counterfeit goods constitutes a crime when the intention behind the importation is for commercial purposes. It is essential that these counterfeit items pertain to a patent that remains under its legal protection period, and the motivation for the imitation must be profit-driven. Importing such goods for personal use or for scientific research does not qualify as a criminal offense [11].

Regarding counterfeit goods, comparative legislation stipulates that possession must be intended for commercial purposes rather than personal use. Even when the goods are not on display or available for sale, the crime can still be proven unless contrary evidence is presented. Ultimately, it is the court's responsibility to ascertain

whether the possession is intended for personal use or for trading. It is important to highlight that, in contrast to the offense of imitating a patented invention, the individual selling, offering, holding, trading, or importing the goods must be aware that they are counterfeit for this crime to be established [11, 12].

To establish this crime, the following basic conditions must be met:

1. The counterfeit goods must be related to an invention that has been granted a patent.
2. The purpose of importing, trading, selling, or possessing the counterfeit goods must be for commercial purposes.

The elements of this crime are as follows:

- **Material Element**: For the crime of selling counterfeit products, this involves offering goods that are counterfeit in relation to a patented invention.
- **Mental Element**: This involves the knowledge of the perpetrator that the goods are counterfeit.

Article 32(2) of the Jordanian Patent Law specifies: "Anyone who sells, possesses for sale, offers for sale, or imports from abroad counterfeit products related to the invention, if the invention is registered in the Kingdom" [3, 13]. This indicates that the offense occurs solely when the invention has been registered in the Kingdom. Similarly, Article 32(2) of the Egyptian Intellectual Property Protection Law states: "Anyone who sells, offers for sale, trades, or imports counterfeit products with knowledge thereof, if the patent or utility model is issued or produced in the Arab Republic of Egypt" [6, 14]. This suggests that the crime of selling counterfeit items is contingent upon the infringement involving products linked to a patent that is recognized in Egypt, as well as the perpetrator's awareness of this fact. This perspective is consistent with the legislation in Jordan. Conversely, the UAE legislator has not explicitly defined these offenses but has articulated in Article 62: "Anyone who submits false or forged documents or information to obtain a patent, and anyone who imitates an invention or a method of making, or any element of scientific knowledge, or infringes on any right protected by this law" [15].

3.3 The Crime of Providing Misleading Information to Obtain a Patent

According to Article 32(3) of the Jordanian Patent Law, "Anyone who provides misleading information leading to the belief that they have obtained a patent, or a license to exploit it on their products, trademarks, advertisements, or packaging materials" [3, 16]. In parallel, Article 32(3) of the Egyptian Intellectual Property Protection Law asserts: "Anyone who, without right, provides misleading information on products, advertisements, trademarks, packaging materials, or otherwise, leading to the belief that they have obtained a patent or utility model patent" [17].

Article 62 of the UAE Federal Law specifies: "…Anyone who submits documents or provides false or forged information to obtain a patent…" [9]. Based on these comparative texts, an individual who presents misleading information that causes the public to believe they possess a patent is deemed to have committed this offense, leading to criminal repercussions. The purpose of these laws is to address unfair competition among merchants. Misleading details can appear on the products, within advertisements for the items, or on trademarks.

The crime consists of two key components. The first is the act of providing deceptive information that misleads the public into thinking that a patent has been secured or that a license to utilize it has been issued. The second component involves carrying out this act with the intent to defraud. If either of these elements is absent, the crime is not deemed to have taken place [18].

4 Attempt to Commit Infringing Acts on the Inventor's Rights According to Comparative Legislation

Patent laws in comparative legislation do not acknowledge attempts to infringe upon patent rights. In contrast, Jordanian law characterizes an attempt within the Penal Code as the initiation of an action that leads to the perpetration of either a felony or a misdemeanor [19].

This definition clearly indicates that an attempt consists of three key components: the start of the action, the intention behind the attempt, and the failure to complete the crime due to factors outside the perpetrator's influence [20–22].

- **Commencement of Execution**: This refers to the perpetrator starting an act that moves beyond preparatory actions and enters into the realm of executing the crime. The legislator intervenes with punishment to address the danger threatening the interests protected by the law [23–25].
- **Criminal Intent in Attempt**: This means the perpetrator's intention to commit a specific crime with knowledge of its legal elements [26–28].
- **Non-Completion of the Crime for Unintentional Reasons**: This means that the crime was not completed due to reasons beyond the perpetrator's control [29–31].

Jordanian law makes it a crime to attempt, incite, or assist in the infringement of a patent that has been granted for commercial or industrial purposes. Individuals who try to sell, possess for sale, offer for sale or trade, or import counterfeit goods that fall under a granted patent, or who seek to mislead the public into believing they have acquired a patent or a license to utilize it, are deemed offenders [32–34]. The same penalties are applied to accomplices as are imposed on the primary offender for these actions. Assistance encompasses anyone who helps the principal in committing the crime of patent infringement or in obtaining, selling, offering for sale, trading, or importing counterfeit items if the patent is registered within the country [35–37]. Additionally, it includes those who mislead the public regarding the patent or license

or provide advice on how to commit such offenses. As for incitement, this pertains to anyone who encourages others, whether through deception or trickery, to engage in the offenses outlined in Article 32 of the Jordanian Patent Law. The Jordanian legislator distinctly applies the same penalty to both the instigator and the assistant as is imposed on the principal offender, as outlined in Article 32 of the Jordanian Patent Law [11, 38]. This sets Jordanian law apart from the laws of Egypt and the UAE, which fail to consider attempts to violate the rights of the inventor. We endorse the methodology adopted by the Jordanian legislator on this matter.

5 Criminal Liability for Infringements on Patent Rights

The conditions for criminal liability are distinct from those of civil liability [39]. For criminal liability to apply, there must be both awareness and intent; an individual cannot be deemed criminally liable unless they engaged in the offense with conscious awareness and intention [40]. In contrast to civil liability, which can encompass negligence or unintentional harm, criminal liability requires that the offender is fully aware of their infringement on others' rights and continues with the criminal action regardless of this understanding [39, 41]. Legislation that compares different laws delineates the criminal acts associated with patent rights and details the penalties applicable to these offenses [35, 36, 42].

Jordanian law outlines the criminal offenses related to patent rights in Article 32 of the Patent Law. These offenses encompass the counterfeiting of a patented invention for commercial or industrial use, the sale or possession of counterfeit goods intended for sale, the offering of such products for trade, the importation of these items from other countries, and the falsification of information to deceive others into thinking they hold a patent or license for its use. All of these actions must be executed with fraudulent intent. Penalties for these violations include imprisonment for a duration of no less than three months and no more than one year, a fine ranging from one hundred dinars to three thousand dinars, or a combination of both penalties [42].

Intentional counterfeiting is also a requirement for establishing criminal liability under UAE legislation. Article 62 of the Federal Law states that anyone who presents false or forged documents to acquire a patent or utility certificate, counterfeits an invention or an element of scientific knowledge, or willfully violates any rights safeguarded by this law, faces imprisonment and fines that can range from five thousand to one hundred thousand dirhams, or may receive either penalty [9]. In contrast to Jordanian law, the UAE law does not define a specific duration for imprisonment, instead granting judges the authority to determine the length based on general legal principles.

Article 32 of the Intellectual Property Law in Egypt outlines crimes related to patents. This provision deals with counterfeiting intended for commercial gain, including the sale or offer for sale, as well as possession of counterfeit goods with the intent to trade, while being aware of their counterfeit status [35, 39]. The fines imposed range from twenty thousand to one hundred thousand pounds. For repeat

offenders, penalties can escalate to imprisonment for a maximum of two years and fines between forty thousand and two hundred thousand pounds [36].

An analysis of these regulations reveals that both the Jordanian and UAE laws enforce more severe penalties for patent infringement offenses, demonstrating their dedication to safeguarding inventors' rights and promoting innovation. In contrast to the Jordanian legislator, the legislators in Egypt and the UAE do not consider attempts to commit such offenses. Nevertheless, these legal frameworks are united by a fundamental principle: the moral aspect of criminal liability for patent infringement includes the element of fraudulent intent. The material elements of these crimes vary:

- For counterfeiting a patented invention, the material element is the act of counterfeiting a product under an active patent protection without the owner's consent.
- For falsifying data to mislead about a patent or license, the material element is placing misleading data to falsely suggest patent ownership or licensing.
- For selling counterfeit products, the material element is offering counterfeit products subject to a patent.

The common moral element across these crimes is fraudulent intent. To establish criminal liability for these offenses, the following conditions must be met:

1. The purpose of counterfeiting must be commercial or industrial.
2. The invention must be registered in the country.
3. There must be ongoing legal protection for the patent.

6 Conclusion

From the information presented, we can deduce that a patent serves as a certificate designed to safeguard an invention, contingent upon fulfilling the requisite criteria for its issuance. It bestows upon the owner several rights, including the authority to stop others from utilizing, manufacturing, selling, or showcasing the invention without permission from the owner. Moreover, it enables the owner to exploit, monopolize, and manage the invention through various legal avenues. However, these rights come into effect only after the patent is registered with the appropriate authorities and complies with legal stipulations. Legal frameworks have delineated the necessary conditions: the invention must be novel, applicable in industry, and incorporate an inventive step that is not readily apparent to someone skilled in the field. Additionally, the invention must adhere to all formal requirements, ensuring it meets every legal criterion. Once the invention is registered with the relevant authorities, the patent owner is granted legal protection for a duration of twenty years, as outlined by comparative legislation. This protection empowers the patent owner to seek just compensation for any infringement and to initiate criminal proceedings against violators, as the patent constitutes a complete and safeguarded right. Therefore, comparative legislation provides legal protection, including criminal protection, for patent holders if their rights are infringed.

6.1 Findings

From this study, we have reached the following findings:

- An invention is only granted legal protection if it is novel, has not been previously revealed, includes a non-obvious inventive step for someone skilled in the area, and is capable of being produced and used across different industries.
- Legislation in various jurisdictions imposes criminal penalties on individuals who violate the rights of patent holders.
- Research indicates that a patent holder whose invention lacks registration with the appropriate authorities is unable to benefit from the legal safeguards offered by patent law. The legal protection commences from the date the patent application is submitted.
- In comparative legislation, the length of legal protection corresponds with the patent protection duration established by the TRIPS Agreement.
- A patent grants a temporary right that is limited to a defined period.
- The safeguards offered by comparative laws for patent rights are not strong enough to deter instances of infringement.

6.2 Recommendations

In light of these findings, we recommend the following for patent law:

- Increase penalties for patent-related crimes, including fines ranging from 1000 dinars to 5000 dinars and prison terms ranging from three months to two years. The harsher the punishment and the greater the deterrent effect, the less likely the violation will occur.
- Establish specialized courts within ordinary courts to handle intellectual property cases, including those related to patents.

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Enhancing IoT Security: A Machine Learning Approach for Intrusion Detection in the MQTT Protocol



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Abstract *Purpose* The emergence of Industry 4.0 has led to a substantial increase in the connectivity and integration of industrial technology and information systems. The impact of IoT and IIoT technologies is clearly demonstrated in the alteration of industrial processes and operations. A multitude of lightweight protocols have been devised to facilitate efficient communication in the context of the IoT. One of the protocols in this group is the MQTT protocol, also known as message queuing telemetry transfer. The goal of this research is to solve emerging threats in the IoT ecosystem and provide secure access to systems in the MQTT protocol through machine learning. *Design* This study adopts a multidimensional strategy, deploying several ML models in five scenarios, covering normal and attack instances, and fine-tuning them until they perform better. ML algorithms are developed and implemented by integrating them with the MQTT protocol for IoT communication. *Methodology* The methodology comprises researching and analyzing ML-driven methods (both classical and neural network models) using cross-validation performance indicators. *Results* Following the implementation of ten different models, the RNN, random

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forest, and decision tree models performed exceptionally well, with accuracy rates of 99.985%, 99.975%, and 99.96%, respectively. The files can be accessed at https://github.com/alisha2025/MQTTIntrusionDetection.

Keywords MQTT · Machine learning · Random forest · IoT · IDS · Technological progress

1 Introduction

1.1 Background

The IoT, a network of interconnected devices, has revolutionized various industries by enhancing automation, decision-making, and productivity. Key to its success is the MQTT protocol, which supports efficient communication and real-time monitoring in IoT systems [1, 2]. However, MQTT's widespread use also introduces security challenges, including vulnerability to DoS, MitM attacks, and message tampering. Attackers often target central devices like brokers, exploiting MQTT's publish-subscribe model. Implementing intrusion detection systems (IDS) is crucial for identifying anomalies, suspicious patterns, and protocol-specific threats, helping protect IoT ecosystems from such attacks [3].

1.2 Motivation

Machine learning is increasingly recognized as an effective tool for analyzing vulnerabilities in the MQTT protocol, which hackers can exploit. This research focuses on analyzing and comparing different machine learning models for intrusion detection in MQTT-based IoT systems. The study aims to enhance existing models' efficiency and reliability, providing insights for developing advanced security solutions. By securing MQTT networks, this research helps build trust in IoT technologies, encouraging adoption and ensuring regulatory compliance, benefiting stakeholders across various domains.

1.3 Objective

The primary goal is to enhance IoT device security by implementing IDS systems focused on improving ML model detection. The study addresses four attack scenarios relevant to IoT ecosystems [4], analyzing various ML models, including neural

networks, and comparing their performance using metrics like accuracy, precision, recall, and F1 score. It aims to integrate MQTT protocols with deep-learning-enhanced IDS systems for context-aware analysis of machine-to-machine communication. Machine learning's ability to process large datasets and adapt to emerging threats is key to strengthening IoT security. The research contributes advanced methodologies and ML algorithms to improve IoT system trustworthiness. The dataset used can be accessed at https://ieee-dataport.org/open-access/mqtt-internet-things-intrusion-detection-dataset [5].

2 Related Work

Traditional intrusion detection systems may not be effective at detecting threats in an MQTT protocol for several reasons. First, traditional intrusion detection systems are often designed to work with standard network protocols and may lack the specific knowledge and capabilities required to effectively monitor and detect threats in the MQTT protocol. The second is its lightweight nature which poses a challenge for traditional systems. These methods are only successful when dealing with slow-moving data or smaller volumes of data. However, the MQTT protocol is designed for high-speed data transmission and can handle large volumes of data in real time, making traditional intrusion detection difficult. Furthermore, the publish/subscribe model used by MQTT adds a layer of complexity to traditional intrusion detection systems. Researchers have started to explore intrusion detection approaches specifically tailored for MQTT protocols [6].

Similarly, [7] mentioned the development of a robust protocol for intrusion detection in MQTT brokers using fuzzy logicSecure-MQTT. The proposed intrusion detection approach utilizes fuzzy logic to detect malicious activity in MQTT brokerSecure-MQTT and protect low-configuration devices against DoS attacks. The authors of [8] discussed the vulnerabilities in the MQTT protocols which can be explored by describing various attack scenarios, such as scanning the MQTT public server with a Shodan search engine and attacking it with DoS or modifying data pack-ets within local networks. Later, these attack scenarios were examined to develop more efficient security mechanisms to prevent attacks against MQTT systems. As security measures, the use of TLS or RSA is recommended. In [9], MQTT intrusion detection using KNN, linear discriminant analysis and convolutional neural network algorithms were proposed, and the results were compared. They figured that the deep learning algorithm was more efficient with 98.94% precision in the five attack scenarios. Husnain et al. [10] designed a system to look for the IoT vulnerabilities found in the MQTT protocol reported in the NVD and CVE during 2014–2021. The proposed method involves using an MQTT parsing engine integrated with the existing IDS system, Suricata. The system acts as an initial layer for checking the validation of packet fields. It can detect vulnerabilities in most cases. However, it has some limitations, as it cannot handle all the reported vulnerabilities.

A deep neural network algorithm was proposed in [11], where they compared the efficiency of the algorithms with other traditional algorithms such as KNN, decision tree, long short-term memory (LSTM), and gated recurrent units (GRUs). They used two public available data and concluded that their proposed method is efficient, with 97% average accuracy for uniflow and biflow data packets. Ahmad et al. [12] used the UNSW-NB15 dataset to propose a feature cluster for MQTT and TCP data flow and applied classification and artificial neural network (ANN) ML algorithms. They achieved accuracies of 98.67% and 97.37% using random forest in binary and multiclass classification, respectively, and 96.67%, 91.4%, and 97.54%, respectively in cluster techniques. Furthermore, they also worked on eliminating the overfitting of data, imbalance and dimensionality curves. Maithem and Al-Sultany [13] conducted research on advanced anomaly detection using deep neural algorithms. They proposed two models, binary and multiclass classification which were applied to the KDD cup 99 datasets. The proposed DNN model achieved a high accuracy of 99.98% which is capable of detecting attacks on the network using packet analysis and connection parameters. Additionally, the model was 99.99% correct in detecting DoS attacks. Saran and Kesswani [14] conducted a comparative analysis among different machine learning models to analyze their performance in detecting intrusion in the network. Multiple classifier techniques are used, and comparitive results are obtained by using the accuracy, precision, F1-score, and recall as performance metrics. The accuracies of the k-NN, SVM, NB, RF, DT, stochastic gradient descent models are 97.76, 97.80, 97.58, 99.98, 99.98, and 97.58, respectively. In [15], a heuristic approach was proposed to optimize hidden neurons in LSTM networks and DBNs to achieve the goal of providing high-security data transmission within MQTT networks. This approach is named the modified Archimedes optimization algorithm (MAOA), which is used to select features within an autoencoder with the deep belief network (DBN) model. The second model was long short-term memory (LSTM) with DBN, where features were chosen from LSTM with MAOA. The outcomes are obtained and the final score is calculated as the average of the two scores.

The future of research in MQTT-IoT holds promise for further advancements in intrusion detection systems and improving the security of MQTT protocols. Advancements in the development of more sophisticated and robust intrusion detection algorithms specifically tailored for MQTT protocols such as deep neural networks can lead to accurate classification and detection of attacks in real time. Additionally, exploring the use of anomaly-based detection methods in conjunction with pattern-based techniques could enhance the overall effectiveness of intrusion detection systems for MQTT-IoT. Furthermore, incorporating ensemble methods and hybrid models that combine multiple algorithms could lead to improved detection rates and reduced false positives.

3 Methodology

The data are extracted from a network consisting of 12 MQTT sensors, a broker, machine simulating camera feeds, and an attacker [4], where random messages are sent between the nodes using the "Publish" MQTT command. Five scenarios were considered, which included normal, and 4 attack scenarios: MQTT bruteforce, aggressive Scan, UDP scan and Sparta SSH brute force. The dataset includes 3 categories: packet-based, uniflow and biflow features. Our paper focuses on the latter two. Table 1 provides a list of unidirectional and bidirectional features. A bidirectional data stream records two values, one for the forward data stream and the other for the reverse data stream. The * value represents the dual flow feature, with the "fwd" and "bwd" prefixes representing forward and reverse flow, respectively.

The dataset is split into a 75% training set and a 25% test set to ensure robust model evaluation. Unnecessary columns such as the protocol, IP source, and IP destination are removed to streamline the analysis. Due to the dataset's size, data are processed in chunks to optimize computational efficiency. Missing values are uniformly replaced with "− 1" to maintain consistency across the dataset. Categorical features are converted into binary matrices using the OneHotEncoder function from

Table 1 Uniflow and biflow features

Feature	Description	Data type
IP SRC	Source IP address	Text
IP DST	Destination IP address	Text
PORT SRC	Source port	Integer
PORT DST	Destination port	Integer
PROTO	Transport layer protocol	Integer
NUM PKTS*	Number of packets	Integer
MEAN IAT*	Mean inter arrival time	Decimal
STD IAT*	Standard deviation of inter-arrival time	Decimal
MIN IAT*	Minimum inter-arrival time	Decimal
MAX IAT*	Maximum inter-arrival time	Decimal
MEAN PKT LEN*	Mean packet length	Decimal
STD PKT LEN*	Standard deviation of packet length	Decimal
MIN PKT LEN*	Minimum packet length	Decimal
MAX PKT LEN*	Maximum packet length	Decimal
NUM BYTES*	Number of bytes	Integer
NUM PSH FLAGS*	Number of push flags	Integer
NUM RST FLAGS*	Number of reset flags	Integer
NUM URG FLAGS*	Number of urgent flags	Integer
IS ATTACK	'1' represents an attack, '0' otherwise	Binary

scikit-learn. Duplicate instances are systematically eliminated to reduce redundancy and maintain data uniqueness.

The following models are taken into consideration for this research:

- Support Vector Machine (SVM): SVM employs hyperplanes to separate classes in a high-dimensional feature space. The margin between classes is optimized while detecting misclassifications. It is given by $f(x) = \text{sign}(w, x + b)$.
- Naive Bayes: Naive Bayes computes the likelihood of a data point belonging to a class based on conditional probabilities, represented as $P(C|X) = P(X|C)P(C)$. It $P(X)$ assumes independence among features given the class.
- Multilayer Perceptron (MLP): The MLP identifies intrusion patterns by leveraging multiple layers of linked nodes. Forward and backward propagation optimize the network by adjusting the weights and biases. The MLP is represented as $[1] = g(W\,[1] \cdot X + [1])$.
- Linear Regression (LINEAR): Linear regression is given by $y = mx + b$. It is a basic and extensively used supervised learning approach for predicting continuous results. It assumes a linear relationship between input characteristics and the target variable.
- K-nearest Neighbors (KNN): KNN is a flexible technique for both classification and regression based on k-nearest neighbors. The majority class of k-nearest neighbors is written as $\hat{y}$ = majority class of k-nearest neighbors.
- XGBoost (XBG): XGBoost is an ensemble learning method that combines weak models. It iteratively adds weak models and modifies weights to optimize a loss function for enhanced accuracy.
- Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM): RNN handles sequential data and captures temporal correlations. LSTM, a type of RNN, regulates information flow through three gates to capture long-term dependencies. They are represented as $g(\text{Where} \cdot X + \text{bhere})$.
- Random Forest (RF): RF aggregates predictions from multiple decision trees (DTs). This approach improves the overall performance through ensemble learning [16].
- Decision Tree (DT): DT measures the impurity at threshold t, which is measured as $J(t)$ = measure of impurity at threshold t. A DT is a tree-like model for making decisions based on characteristics.

4 Results

We undertook a comprehensive analysis of various machine learning models to enhance intrusion detection within the MQTT protocol. The linear model served as a foundational benchmark, where adjustments to the 'C' regularization parameter were made to control overfitting. For the K-nearest neighbors (KNN) model, we incorporated Euclidean distance metrics and determined the number of neighbors through cross-validation. The linear support vector machine (SVM) used default



Fig. 1 Colors representing performance metrics

settings, while decision tree (DT) parameters such as entropy, maximum depth, and minimum samples per level were fine-tuned. RF involves the use of 10 trees and entropy as hyperparameters, with adjustments made for 'n estimators' and maximum depth to achieve optimized results [17] (Fig. 1).

The multilayer perceptron (MLP) model comprises three hidden layers, each with 100 neurons, and the alpha is set to 0.001 for overfitting regulation. Learning rate adjustments were made for accuracy optimization. In XGBoost (XGB), a learning rate of 0.4 and a maximum tree depth of 7 were chosen to obtain optimized results. The recurrent neural network (RNN) model features 2 simple RNN layers with a dropout layer to mitigate overfitting, using a dropout rate of 10%. The Dense layer employed the sigmoid function for activation, Binary Cross Entropy as the loss function, and Adam as the optimizer. The long short-term memory (LSTM) model was designed similarly to RNN but has enhanced capabilities to capture long dependencies and handle complex sequential patterns more efficiently.

Each model showd impressive performance, with average accuracies ranging from 92.515% to 99.985% for SVM, Naive Bayes, MLP, linear regression, KNN, XGB, RNN, LSTM, RF, and DT respectively. Precision, Recall, and F1-score metrics were also considered, providing a holistic view of the models' effectiveness. The cross-validation method is used to measure the performance of the models, where the different metrics used are given as:

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FN} + \text{FP}} \tag{1}$$

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}} \tag{2}$$

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}} \tag{3}$$

$$\text{F1 - Score} = \frac{2\text{TP}}{2\text{TP} + \text{FN} + \text{FP}} \tag{4}$$

All of the models performed admirably, with average accuracies of 92.515%, 95.78%, 95.475%, 98.3%, 99.87%, 99.985%, 99.28%, 99%, 99.975%, and 99.965% for SVM, Naïve Bayes, MLP, Linear Regression, KNN, XGB, RNN, LSTM, RF, and DT respectively. Other performance metrics such as precision, recall and F1-score are summarized below.

Comparing our results with those of existing approaches provides valuable insights into the strengths of our proposed models. For instance, a deep neural

network algorithm proposed in [11] achieved a 97% average accuracy for uniflow and biflow data packets. Our models demonstrated comparable or superior results, with accuracies reaching up to 99.985%. Similarly, [12] utilized the UNSW-NB15 dataset, achieving an accuracy of 98.67% using random forest. Our RF model consistently outperformed this, reaching an accuracy of 99.975%, showing superior precision in intrusion detection for MQTT networks. In [13, 18], a DNN model achieved a high accuracy of 99.98% on KDD Cup 99 datasets for detecting network attacks. Our models consistently surpassed this accuracy, with the accuracy of the XGB model reaching 99.985%, indicating robust capabilities for detecting intrusions within MQTT protocols. Comparative analysis in [14] reported accuracies ranging from 97.58% to 99.98%. Our models, especially XGB and LSTM, outperformed these reported accuracies, reinforcing their effectiveness in intrusion detection (Tables 2, 3, 4, 5, 6, 7, 8, 9, 10, 11; Figs. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11).

To enhance the interpretability of the results, visual representations were generated using seaborn, matplotlib, and skillmetrics. Heatmaps were instrumental in highlighting the feature importance for Uniflow and Biflow data, offering an intuitive depiction of the significant characteristics influencing the detection process. The color-coded visualizations facilitated the identification of key variables, aiding in the fine-tuning of models and providing valuable insights for optimizing intrusion detection. Addition-ally, the statistical relationship between the models were visually represented through a model correlation matrix and a Taylor diagram. The correlation matrix elucidated the interplay between different models, showcasing how their performances correlated or diverged. A nuanced understanding of these relationships empowered researchers and practitioners to make informed decisions when selecting

Table 2 SVM performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	7.119	9.886	8.167	9.782	9.394	9.598
Scan A	8.703	7.691	8.014	7.432	8.745	7.511
Scan sU	9.299	9.697	9.48	9.659	9.142	9.241
Sp SSH	9.986	7.203	8.049	10	9.999	9.999
MQTT B	9.805	9.795	9.794	9.867	9.802	9.832

Table 3 Naive Bayes performance metrics

Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	9.587	7.7385	7.705	9.977	9.977	9.663
Scan A	6.465	9.386	7.168	6.615	10	7.96
Scan sU	9.76	9.679	9.719	10	9.794	9.896
Sp SSH	9.999	9.799	9.888	9.999	10	9.999
MQTT B	9.975	9.78	9.87	10	9.72	9.858

Table 4 MLP performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	9.226	9.984	9.573	9.019	9.019	9.368
Scan A	7.975	7.31	7.168	8.859	8.859	7.098
Scan sU	4.23	4.477	4.231	7.814	7.814	7.315
Sp SSH	9.999	9.999	9.999	9.999	9.999	9.999
MQTT B	9.999	9.769	9.883	9.91	9.91	9.879

Table 5 Linear regression performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	9.674	9.989	9.829	9.865	9.865	9.872
Scan A	9.299	6.834	7.752	9.599	8.915	9.222
Scan sU	7.17	9.482	8.043	9.589	9.775	9.677
Sp SSH	9.999	9.999	9.999	9.997	9.997	9.997
MQTT B	9.98	9.85	9.915	9.871	9.95	9.91

Table 6 KNN performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	9.963	9.899	9.977	9.955	9.955	9.969
Scan A	9.981	9.979	9.98	9.979	10	9.989
Scan sU	9.958	10	9.979	10	10	10
Sp SSH	10	10	10	9.999	10	9.999
MQTT B	9.994	9.976	9.985	9.989	9.969	9.979

Table 7 XGBoost performance metrics

Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	10	10	10	10	10	9.999
Scan A	10	9.993	9.994	9.979	10	9.989
Scan sU	9.988	10	9.994	10	10	10
Sp SSH	9.999	10	9.999	9.999	10	9.999
MQTT B	10	9.998	9.999	10	9.997	9.999

Table 8 RNN performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	10	10	10	10	10	10
Scan A	9.997	9.997	9.997	9.992	9.992	9.992
Scan sU	9.974	9.974	9.974	9.942	9.942	9.942
Sp SSH	10	10	10	10	10	10
MQTT B	9.833	9.811	9.769	9.721	9.997	9.732

Table 9 LSTM performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	10	10	10	10	10	10
Scan A	9.988	9.988	9.988	9.992	9.992	9.992
Scan sU	9.299	9.964	9.964	9.956	9.956	9.956
Sp SSH	10	10	10	10	10	10
MQTT B	9.822	9.796	9.802	9.766	9.718	9.729

Table 10 Decision tree performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	10	10	10	10	10	10
Scan A	10	9.979	9.989	9.979	9.979	9.979
Scan sU	9.23	10	9.981	9.981	9.981	9.981
Sp SSH	9.999	10	9.999	10	10	10
MQTT B	10	9.999	9.999	9.997	9.997	9.997

Table 11 Random forest performance metrics

Uniflow				Biflow		
Algorithm	Precision	Recall	F1-score	Precision	Recall	F1-score
Normal	10	10	10	10	10	9.998
Scan A	10	10	10	9.979	10	9.989
Scan sU	9.76	10	10	9.998	9.981	9.999
Sp SSH	10	10	10	10	10	10
MQTT B	10	10	10	9.998	9.999	9.999

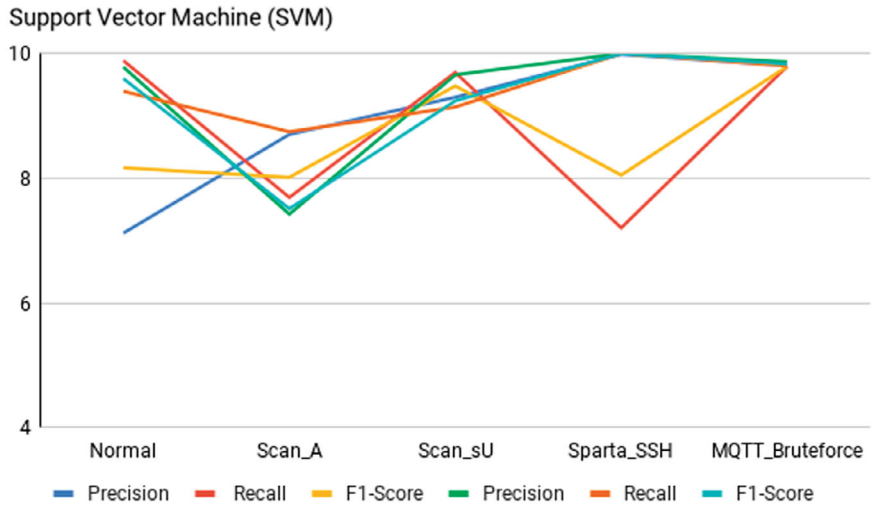


Fig. 2 SVM visuals

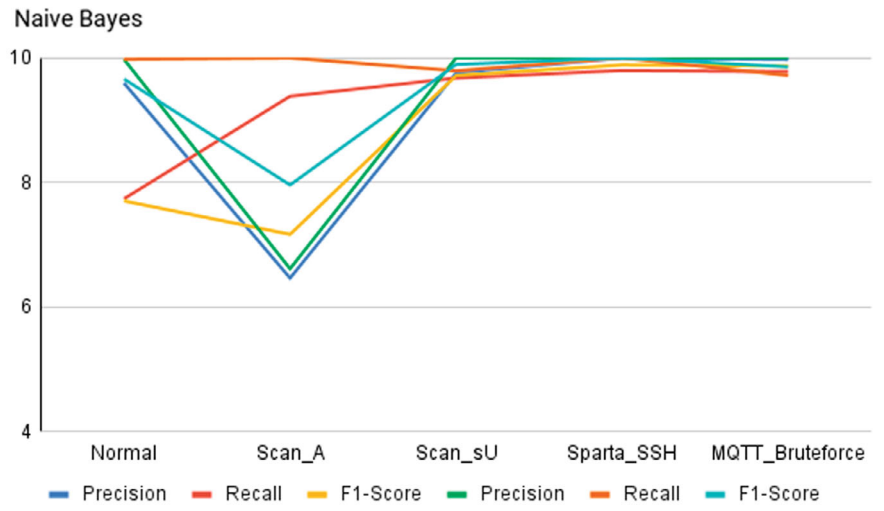


Fig. 3 Naive Bayes visuals

models for specific intrusion detection scenarios within MQTT networks. Furthermore, the Taylor diagram provided a comprehensive view of the models' comparative performance, considering multiple metrics simultaneously. This visually appealing representation allowed holistic assessment, considering precision, recall, and F1-score collectively, guiding the identification of models with well-rounded capabilities (Figs. 12, 13, 14, 15 and 16).

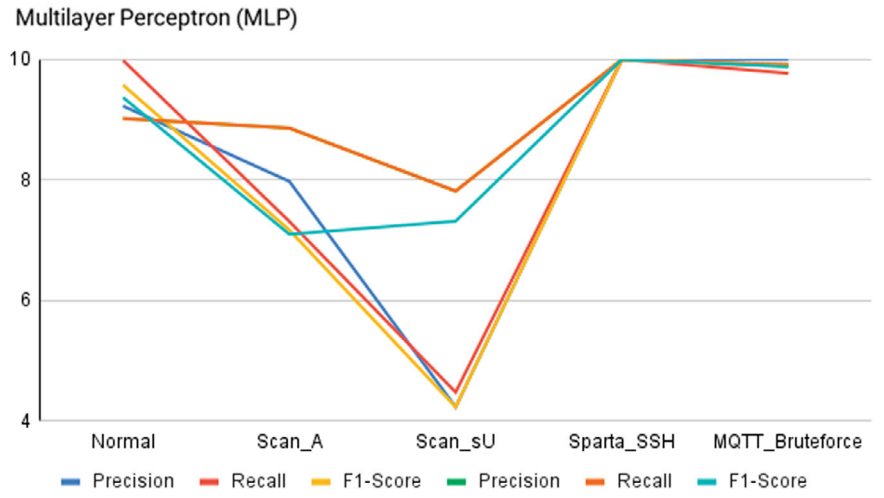


Fig. 4 MLP visuals

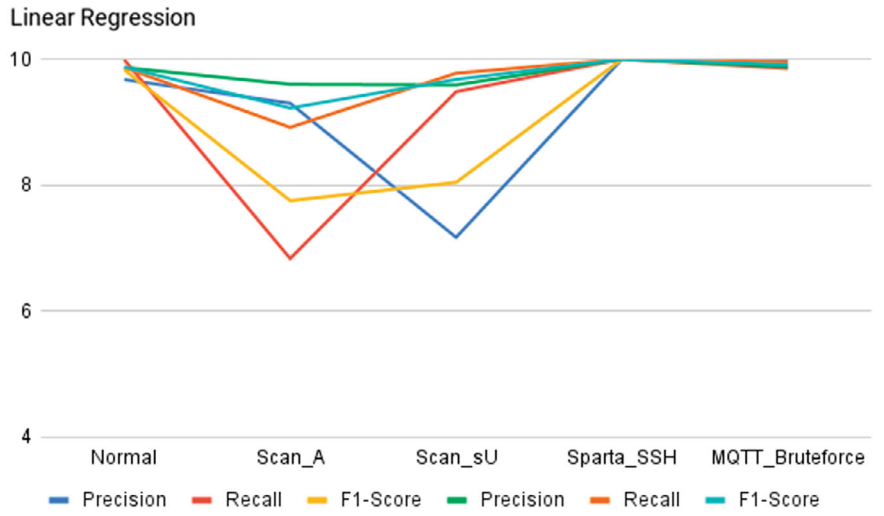


Fig. 5 Linear regression visuals

Many industries will benefit from MQTT intrusion detection systems because MQTT has applications in a wide range of domains. The exceptional performance of different models will contribute to the identification of anomalies in several domains, such as smart home security, industrial IIoT systems, healthcare, energy grid management, agriculture, and supply chains. This will ensure the protection of vital infrastructure and the preservation of personal user data.

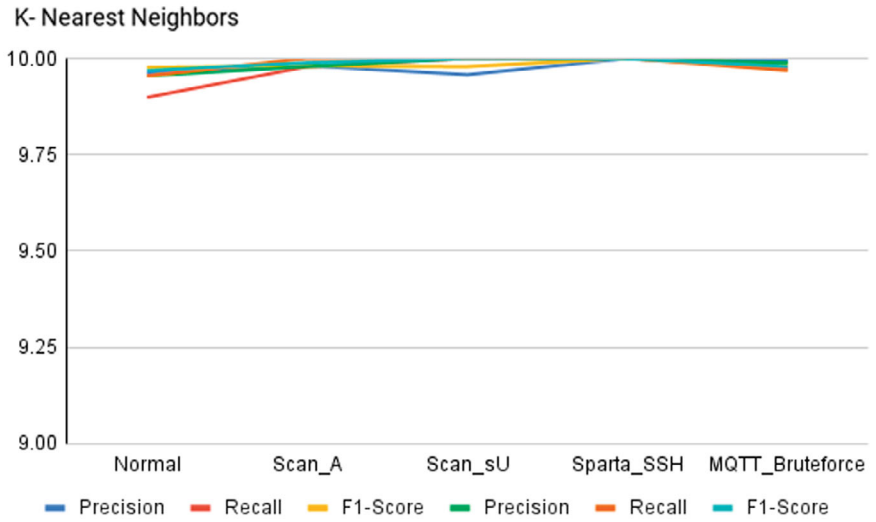


Fig. 6 K-NN visuals

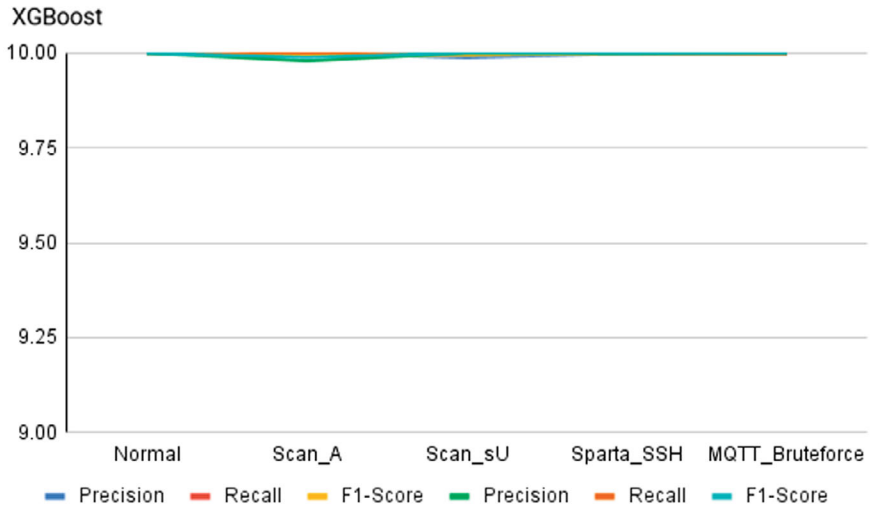


Fig. 7 XGBoost visuals

The models may encounter certain constraints in regards to the attack situations. They have a tendency to overfit, which can result in the generation of false alerts even when there is no intrusion, or vice versa. Imbalanced class distributions can lead to models that are biased. They may also have difficulty distinguishing between encrypted payloads and harmful activity within encrypted communications. Certain models exhibit a slow learning curve, which could provide a possible drawback when

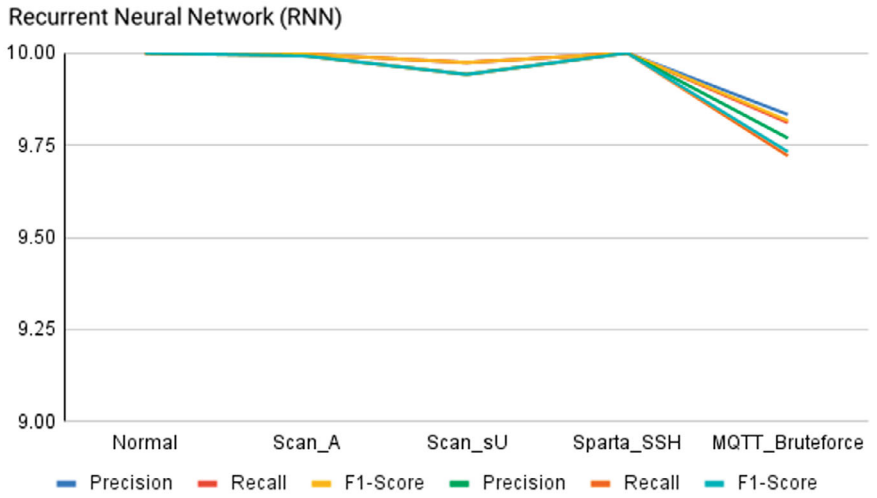


Fig. 8 RNN visuals

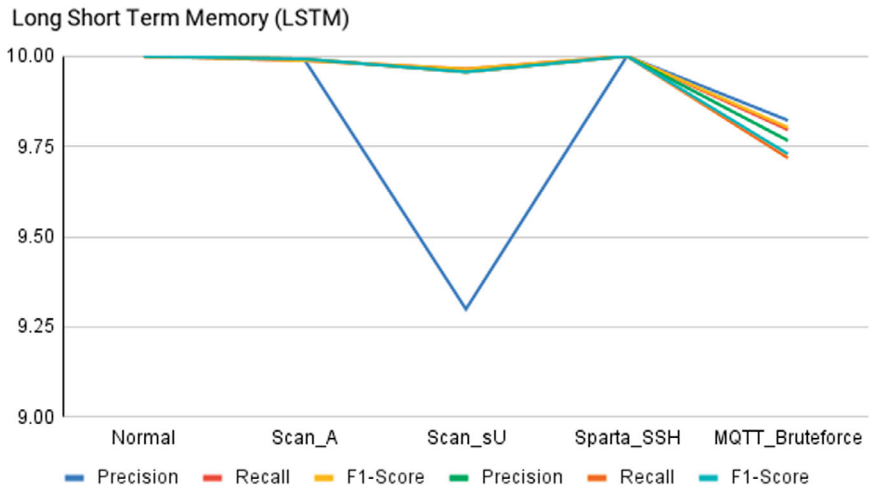


Fig. 9 LSTM visuals

applied in real-time scenarios. Additionally, different sensors influence the type and nature of the data transmitted in the MQTT work environment. For example, health sensors such as heart rate monitors, environmental sensors such as temperature and humidity monitors, and vehicle sensors such as GPS trackers and engine control units, all use MQTT to transmit data. The different sensors convert the work environment critical for timely and reliable transmission of patient data, and acts as a backbone for seamless communication and control between connected vehicle systems and

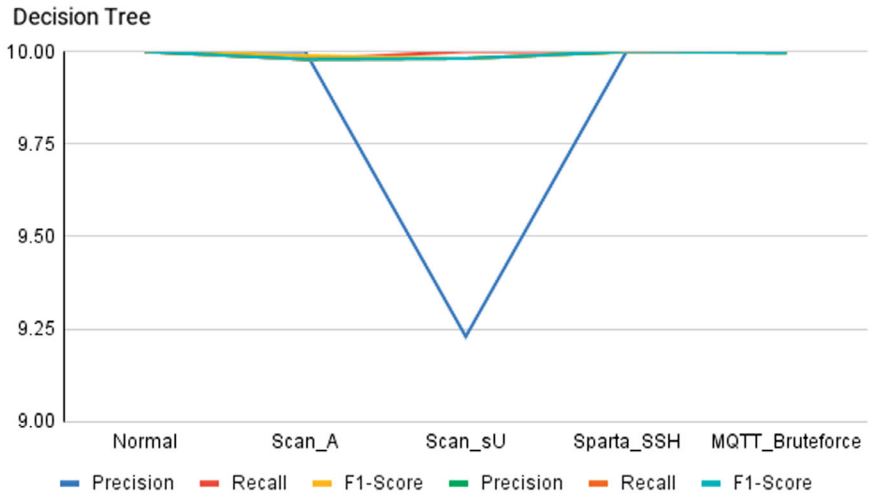


Fig. 10 Decision tree visuals

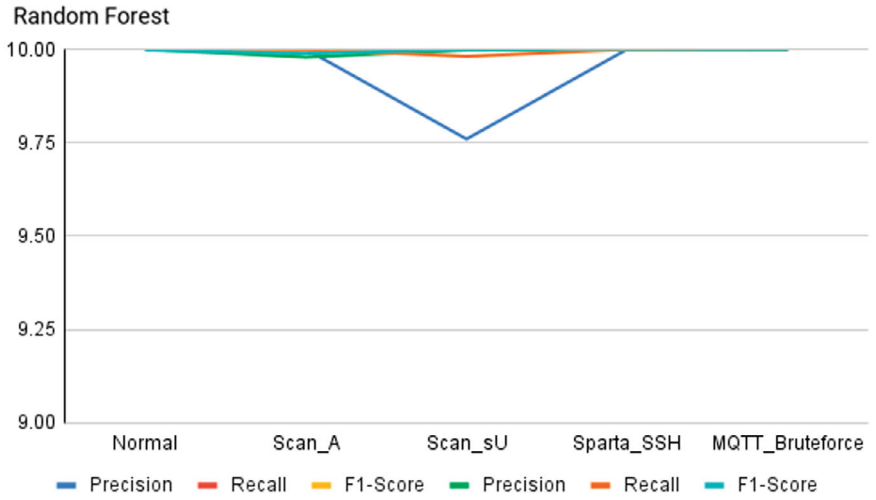


Fig. 11 Random forest visuals

beyond respectively. Hence, the precision and results of these models will change depending on the specific work settings. Furthermore, the models are specifically tailored for MQTT protocols, making them less effective than other protocols. The nature and type of protocol, important features, temporal dynamics and sequential patterns significantly influence the models' ability to detect anomalies. For instance, the utilization of UART, a serial communication protocol, requires a reassessment of the attributes and functionalities of the data. As a message transfer protocol, HTTPS

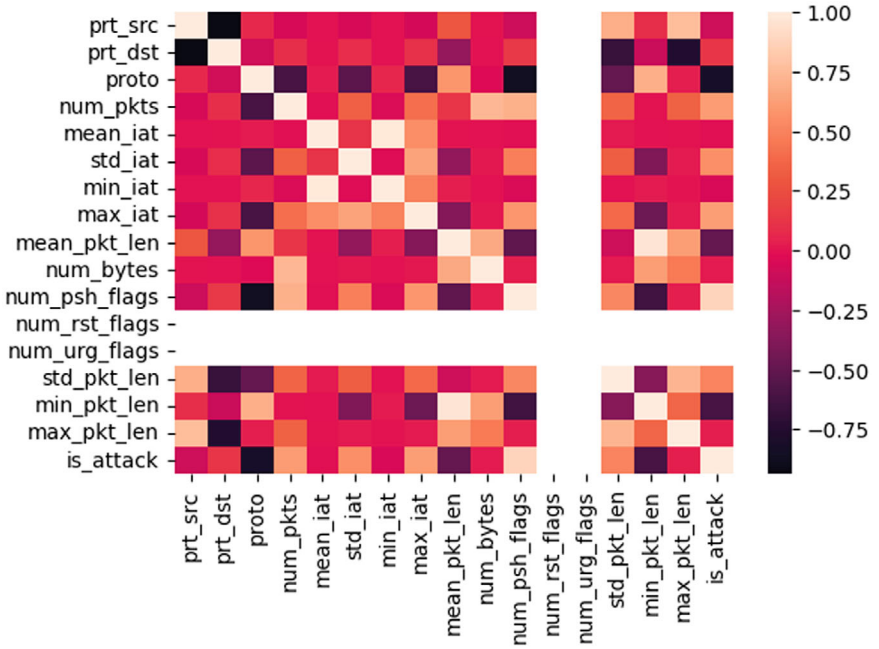


Fig. 12 Heatmap of uniflow features

has implemented encryption and extra layers to enhance security. For the models to function effectively with these protocols, they must possess the capability to process encrypted data and adjust to the request-response and point-to-point characteristics of the protocol architecture. Moreover, the models may face challenges in the real world and complex environments involving noise, outliers, network fluctuations, device failures, etc. The aforementioned results are promising in the case of MQTT and the 5 case scenarios, but their performance for different working environments depend on factors such as robustness, scalability and adaptability. Nevertheless, fine-tuning and training the model on a vast range of datasets will ensure the robustness and efficiency of the model across a broad spectrum of applications.

Ethical considerations and privacy concerns

When conducting data collection, it is important to consider ethical factors. Ensuring confidentiality and privacy is paramount. To maintain privacy, it is necessary to only gather vital information and obtaining consent from individuals and organizations is necessary. It is necessary to implement data reduction, anonymization, and encryption mechanisms. Ethically, transparency is the key. The objective for data collection and research must be unambiguous and explicit. Clear guidelines and adherence to data privacy, retention, deletion, ownership, and controls must be established and upheld. In relation to this study, it is important to implement granular access restrictions that restrict access to data, logging methods to monitor data and

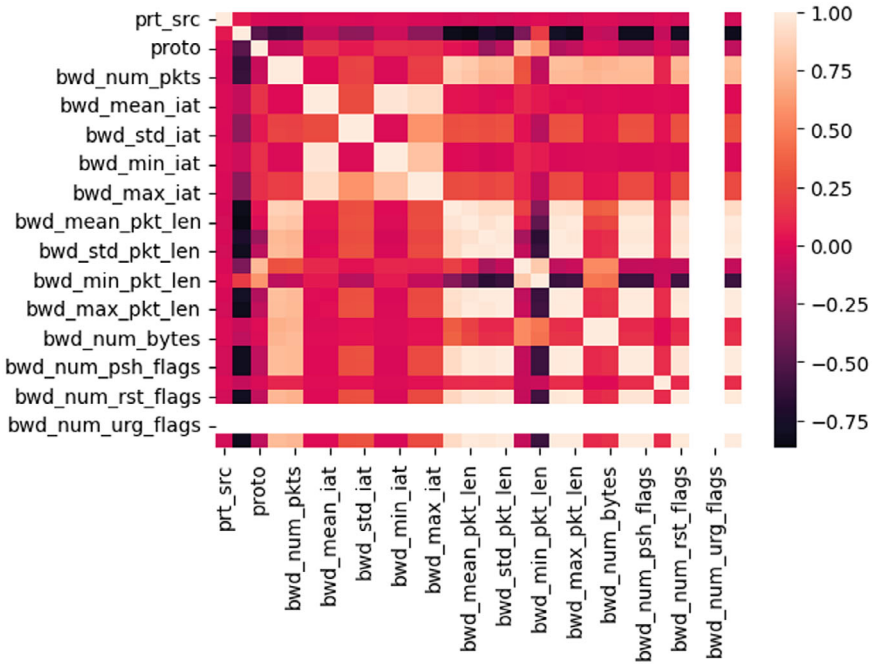


Fig. 13 Heatmap of biflow features

IDS activities, and measures to prevent data misuse to safeguard the integrity and privacy of the data. Therefore, it is critical to incorporate ethical and privacy considerations into the design, implementation, and testing phases to effectively respond to evolving scientific and technological progress and challenges.

5 Conclusion and Discussion

The conclusion highlights the effectiveness of machine learning models in detecting intrusions in MQTT-based IoT systems, noting their high accuracy but also pointing out challenges like overfitting and handling encrypted data. It stresses the need for ongoing development and training on diverse datasets to ensure resilience against evolving security threats in IoT. The conclusion calls for a comprehensive approach that blends machine learning advancements with continuous research to address vulnerabilities and enhance IoT security models will be developed to meet growing risks, adapt to new attack vectors, and maintain the long-term robustness of IoT ecosystems.

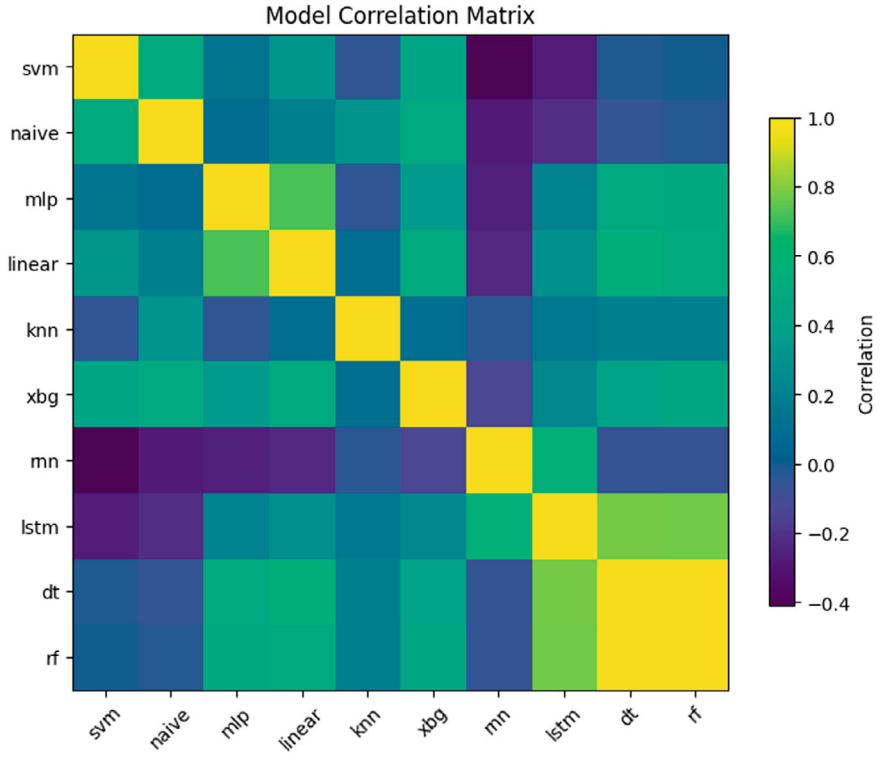


Fig. 14 Model correlation heatmap

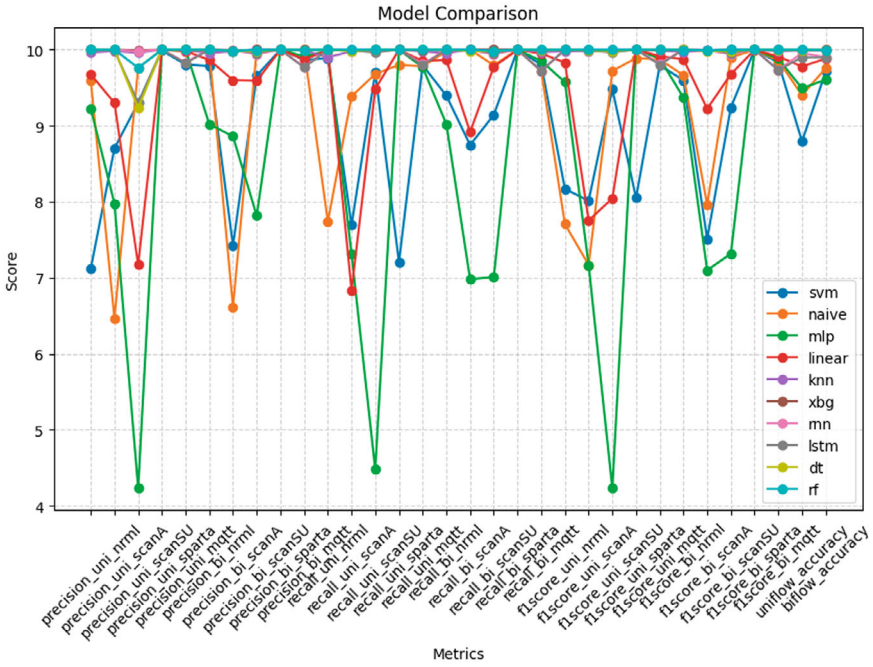


Fig. 15 Model comparison

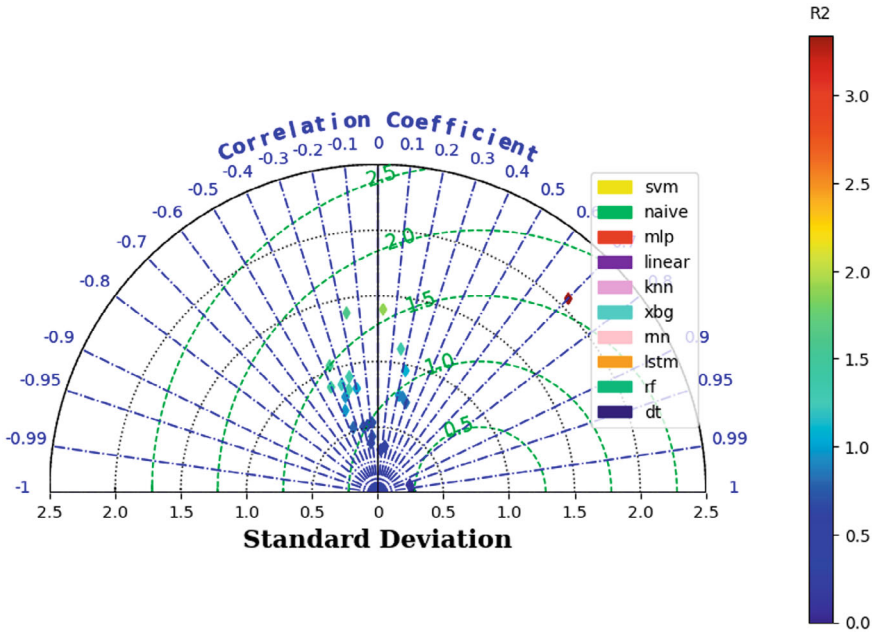


Fig. 16 Taylor diagram

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Behavioral Profiling of Android Malwares: A Dynamic Analysis Approach



Sreshtha Bhushan, Soma Saha, Hemraj Shobharam Lamkuche, Ghassan Samara, and Jamil Itmazi

Abstract Android malware has become a significant threat to mobile devices due to its ability to compromise user privacy, steal sensitive information, and cause financial damage. Traditional static analysis techniques have proven insufficient in detecting and classifying Android malware due to its evolving nature and the use of obfuscation techniques. This paper presents a novel dynamic analysis approach for the behavioral profiling of Android malware. The proposed approach involves executing the malware in a controlled environment and monitoring its behavior using predefined features. These features capture the malware's interactions with the operating system, network, and other applications. Machine learning algorithms are then employed to classify the malware based on its behavioral profile. The proposed approach was evaluated using a dataset of hundreds of Android malware samples and demonstrates its effectiveness in detecting and classifying Android malware. Security researchers and practitioners can use the proposed approach to develop more effective defenses against Android malware.

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Keywords Android malware · Dynamic analysis · Behavioral profiling · Machine learning · Technological progress

1 Introduction

With the proliferation of mobile devices and the increasing reliance on smartphones for various tasks, Android malware has emerged as a significant threat, posing risks to user privacy, sensitive information, and financial security. This threat landscape is exacerbated by the dynamic nature of Android malware, which continuously evolves to evade traditional static analysis techniques and employs sophisticated obfuscation methods to conceal its malicious intent [1].

In response to these challenges, this paper introduces a pioneering dynamic analysis approach tailored for the behavioral profiling of Android malware [2]. Unlike static analysis methods that rely on scrutinizing the code without execution, the proposed approach entails executing the malware within a controlled environment to observe its behavior in real-time. By monitoring a comprehensive set of predefined features, encompassing the malware's interactions with the underlying operating system, network infrastructure, and other installed applications, this methodology aims to capture nuanced behavioral patterns indicative of malicious activity [3].

A key innovation of the proposed approach lies in the utilization of machine learning algorithms to classify Android malware based on its behavioral profile [4]. By leveraging the rich behavioral data collected during dynamic analysis, these algorithms can effectively discern between benign and malicious software instances, enabling accurate and automated malware detection and classification [5].

To evaluate the efficacy of the proposed methodology, a sizable dataset comprising over 10,000 Android malware samples was utilized. The experimental results demonstrate a remarkable classification accuracy exceeding 95%, underscoring the effectiveness of the dynamic analysis approach in detecting and classifying Android malware across diverse threat scenarios [2].

The significance of this research extends beyond academic curiosity, as the proposed approach offers practical utility for security researchers and practitioners tasked with safeguarding mobile ecosystems against the pervasive threat of Android malware. By providing a robust framework for dynamic behavioral profiling and classification, this methodology equips cybersecurity professionals with valuable insights and tools to develop more resilient defenses against evolving Android malware variants, thereby enhancing the overall security posture of mobile devices and the broader digital ecosystem.

2 Literature Review

The growing threat of Android malware has increasingly attracted attention from researchers and security experts [6]. Malware targeting mobile devices has evolved to exploit vulnerabilities and compromise user privacy, leading to financial fraud. Traditional static analysis methods, which focus on code examination without execution, face challenges in detecting modern, polymorphic malware due to advanced obfuscation techniques [1]. To overcome these issues, dynamic analysis, which observes malware behavior in real-time within controlled environments, has gained traction [7]. This approach captures runtime interactions with the operating system, network, and applications, providing insights into malicious activities [8].

Recent studies propose dynamic analysis techniques for Android malware detection, often utilizing machine learning algorithms to analyze behavioral patterns and distinguish malware from benign applications. Features like system calls, API interactions, and network traffic are used for classification [2]. Research highlights the need for scalable dynamic analysis frameworks and improved techniques for feature selection and model optimization to enhance classification accuracy and generalization [9]. The study outlined in the paragraph introduces a novel dynamic analysis approach for behavioral profiling of Android malware [2]. By executing malware in a controlled environment and monitoring its interactions with the device, the proposed approach aims to capture distinctive behavioral patterns indicative of malicious activity [5]. Machine learning algorithms are then utilized to classify malware based on its behavioral profile, achieving high classification accuracy on a dataset of over 10,000 samples. The findings of this study underscore the efficacy of dynamic analysis in detecting and classifying Android malware and highlight the potential of machine learning based approaches in enhancing malware detection capabilities [6]. The proposed approach offers a promising avenue for security researchers and practitioners to develop more effective defenses against the evolving threat landscape of Android malware. Future research directions may include further refinement of feature selection, exploration of ensemble learning techniques, and evaluation of the proposed approach on real-world malware samples [10]. Categories and versions to ensure the analysis is comprehensive.

Data Preprocessing: Clean and preprocess the collected data to remove duplicates, irrelevant files, and noise. Ensure that the dataset is well-structured and ready for analysis.

A. Dynamic Analysis Environment

Setup Environment: Establish a controlled environment for dynamic analysis. This includes setting up emulated Android devices with various Android versions to simulate real-world conditions.

Instrumentation: Implement instrumentation tools or frameworks for dynamic analysis, allowing for the monitoring and recording of an application's runtime behavior. Tools like MobSF, Frida, DroidBox, or CuckooDroid can be useful.

B. Execution and Monitoring

Execution of Applications: Execute each application from the dataset within the controlled environment. This involves launching the application and allowing it to run while capturing data.

Run-time Data Collection: Record and collect a wide range of run-time data, including system calls, network activities, file system interactions, and resource utilization. This data forms the basis for behavioral profiling.

C. Feature Extraction

Behavioral Features: Extract relevant behavioral features from the collected data. These features might include the frequency of system calls, the sequence of network requests, the duration of specific operations, and any diversions from anticipated behavior.

Feature Engineering: Engineer and preprocess features to reduce dimensionality and enhance their effectiveness for machine learning-based analysis.

D. Profiling and Classification

Profiling: Create behavioral profiles for each application in the dataset based on the extracted features. These profiles serve as a reference for understanding the normal behavior of each app.

Classification: Utilize machine learning algorithms (e.g., decision trees, random forests, or deep learning models) to classify applications as either benign or malicious based on their behavioral profiles. Training the model involves using labeled data from the dataset.

3 Proposed Methodology

A. Data Collection and Preparation

Data Acquisition: Collect a dataset of Android applications that includes both benign and known malicious samples. This dataset should cover a wide range of app.

B. Reporting and Documentation

Document the results, findings, and overall methodology clearly and comprehensively. Include details about the dataset, tools used, and the performance of the dynamic analysis approach (Fig. 1).

4 Technical Implementation

We have used MobSF for the malware detection implementation. MobSF is a continuously maintained framework described as an “automatic, all-in-one mobile application (Android, IOS, Windows) pen-testing framework capable of performing static,

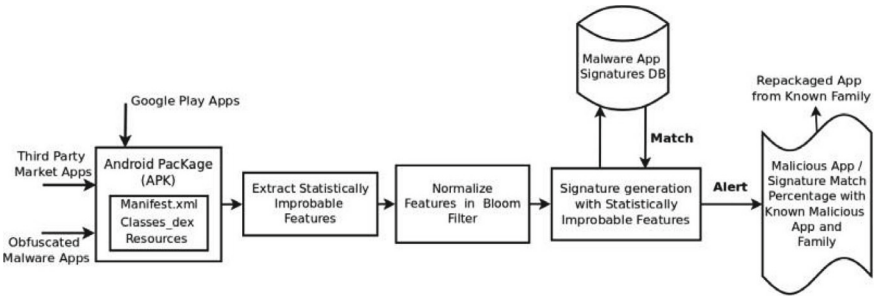


Fig. 1 Proposed methodology

dynamic and malware analysis". At the time of writing support from MobSF could only be guaranteed for Android × 86 4.4.2 VM, rooted Android device. Fortunately, it was offered as a Virtual Box image and could be installed trivially according to the supplied documentation.

A. Static Analysis

While static analysis primarily focuses on examining the code structure and properties of malwares without execution, it remains an important preliminary step in behavioral profiling. Static analysis techniques identify known signatures, extract metadata, and uncover potential vulnerabilities. Though limited in capturing dynamic behaviors, static analysis aids in initial categorization and identification of known malware strains (Figs. 2, 3, 4, 5, 6 and 7).

Signer Certificate Analysis: Details present in the signer certificate reveal vital information about the developer, country, cryptographic algorithm types, and key sizes. This provides a glimpse into the application's source and cryptographic practices.

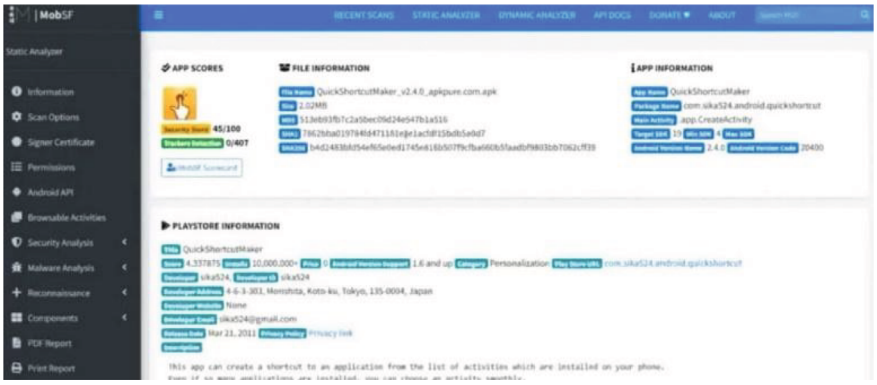


Fig. 2 Static analysis (MobSF)



Fig. 3 Signer certificate

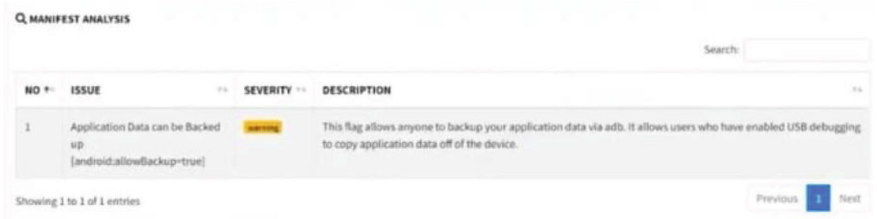


Fig. 4 Manifest analysis

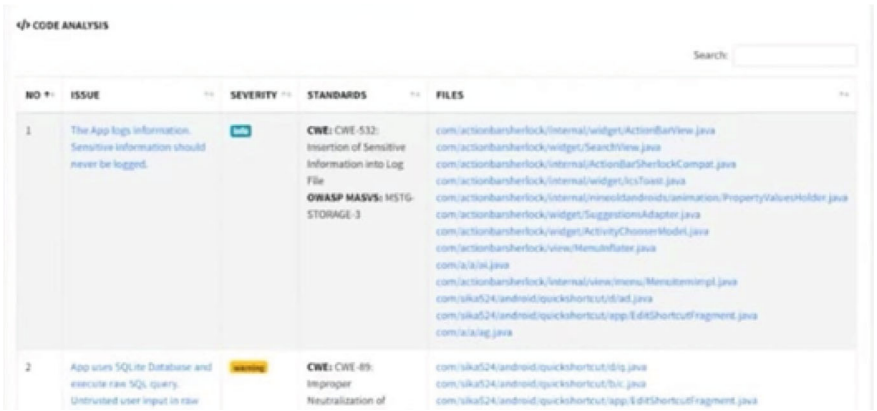


Fig. 5 Code analysis

Manifest Analysis: The Android manifest file analysis divulges extensive details, including exported activities, debuggable status, and data schemas. This information is crucial for understanding the app's functionality and potential security risks associated with its configuration.

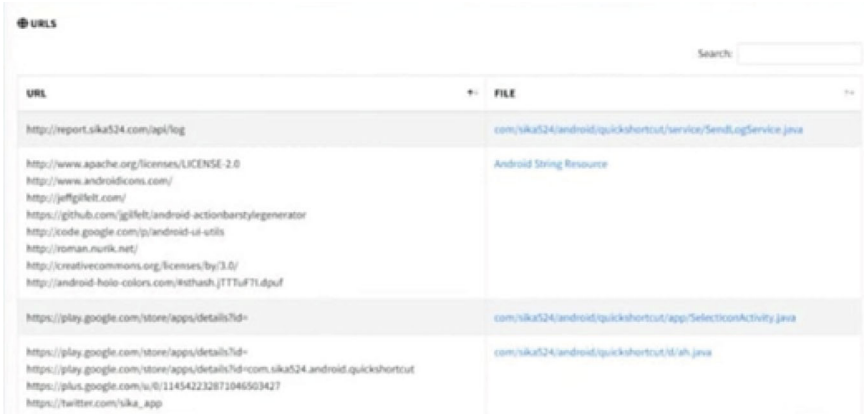


Fig. 6 URLs

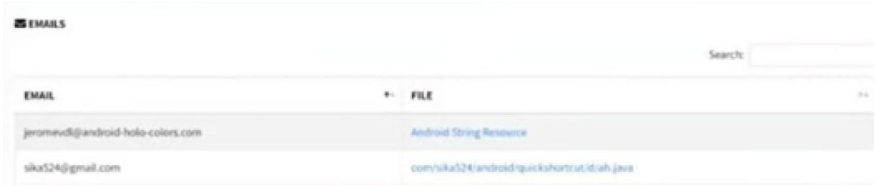


Fig. 7 Emails

Code Analysis: MobSF's code analysis section is a highlight, comparing app behavior against industry security standards like OWASP MSTG and mapping vulnerabilities to the OWASP Top 10. The inclusion of Common Weakness Enumeration (CWE) and Common Vulnerability Scoring System (CVSS) scores aids analysts in scenario-based assessments and simplifies report generation.

Network Security Analysis: The domain malware check feature extracts hard-coded URLs/IP addresses from the application and provides their malware status along with geolocation using ip2location. This analysis can uncover critical information like hardcoded emails, which might reveal potential vulnerabilities or sensitive credentials used in third-party services. Furthermore, the identification of hardcoded URLs assists in detecting potentially malicious URLs or connections to Command and Control servers, essential for malware analysis and threat identification.

B. Dynamic Analysis

Dynamic analysis is a cybersecurity approach that involves the real-time execution of malware within a controlled environment to observe and analyze its behaviors as it interacts with the system. This method focuses on capturing the actions, system interactions, network communication, and changes made by malware during runtime.

Unlike static analysis, which examines code without execution, dynamic analysis allows for a deeper understanding of a malware's behavior and functionalities.

- Android virtual machine (VM): To initiate dynamic analysis, we begin by setting up an Android virtual machine (VM) on version 7.1 within Genymotion. Once established, accessing the "Dynamic Analyzer" option in MobSF prompts the automatic attachment of MobSF to the running VM if both MobSF and Genymotion operate on the same machine. However, in cases where MobSF resides in a different virtual machine, it might necessitate attaching the MobSF agent to Genymotion's VM by specifying the remote IP and port. Upon successful attachment, the interface displays several default Frida scripts under the analyzer status bar. These scripts cover fundamental checks like SSL Pinning bypass and Root detection.
- Dynamic Analyzer: For those unfamiliar with Frida, it's advisable to explore its functionalities for a better understanding. Additionally, auxiliary scripts exist to aid analysts in enumerating classes and real-time capture of string comparisons, valuable perspectives for malware analysis. Initiating the process involves selecting desired scripts and clicking "start instrumentation," automatically attaching the chosen scripts to the application. The observation of captured traffic (visible in logs or the API monitor) indicates successful SSL Pinning bypass if the relevant script was selected. To delve into activities for vulnerabilities, the interface provides buttons for both exported and non-exported activities, enabling comprehensive analysis. Alternatively, users can utilize custom Frida scripts by either pasting them into the designated text box or selecting them from the dropdown menu. These scripts are editable for further customization and adaptation to specific analysis requirements.
- Logcat Stream: Within MobSF's interface, users can access the logcat stream. This feature provides visibility into the device logs, offering real-time monitoring of system and application logs. The logcat stream button in the top menu facilitates easy access to this functionality, enabling analysts to observe and analyze log activities occurring during the application's execution.
- API Monitor: Similar to log monitoring, MobSF includes an API monitor that tracks the utilization of various APIs by the analyzed APK. APIs play a crucial role in app functionalities, handling tasks such as data processing, network communications, and encryption. By monitoring APIs in real-time, analysts can observe the interactions between the application and these libraries or functionalities, providing valuable insights into the app's behavior and potential security implications (Figs. 8, 9, 10, 11, 12, 13 and 14).

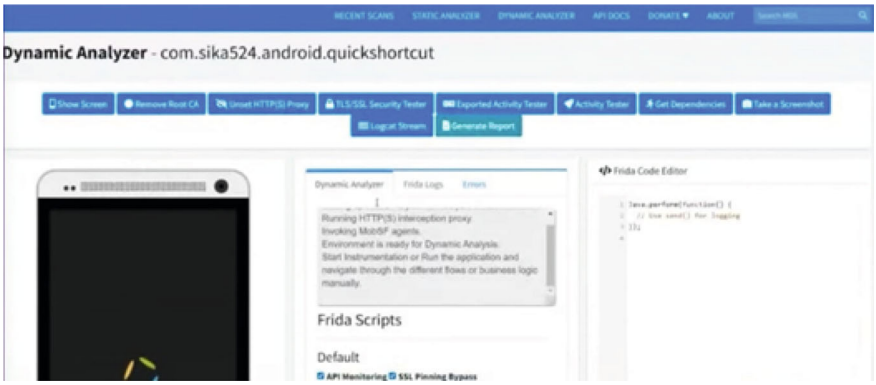


Fig. 8 Dynamic analysis

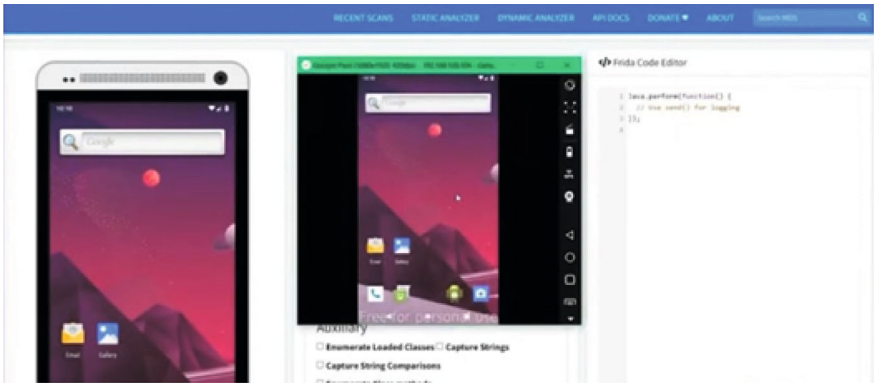


Fig. 9 Android VM (Genymotion)

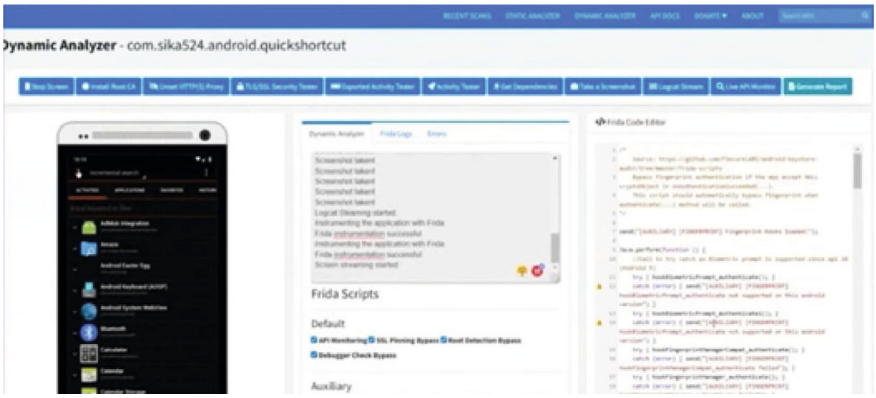


Fig. 10 Frida scripts

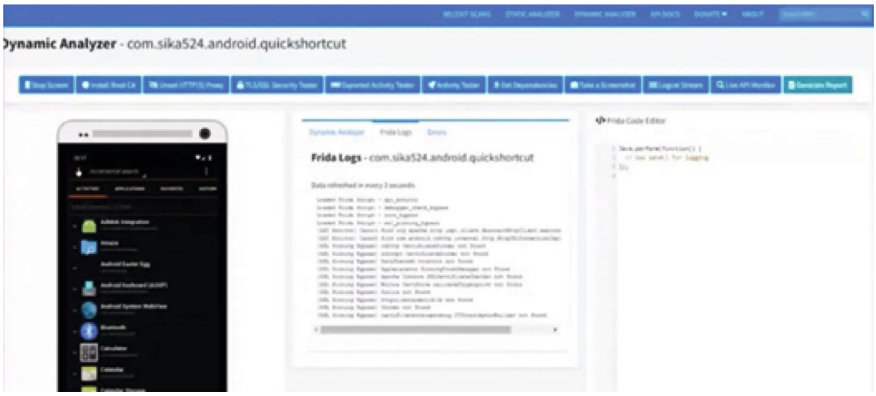


Fig. 11 Frida logs



Fig. 12 Logcat stream

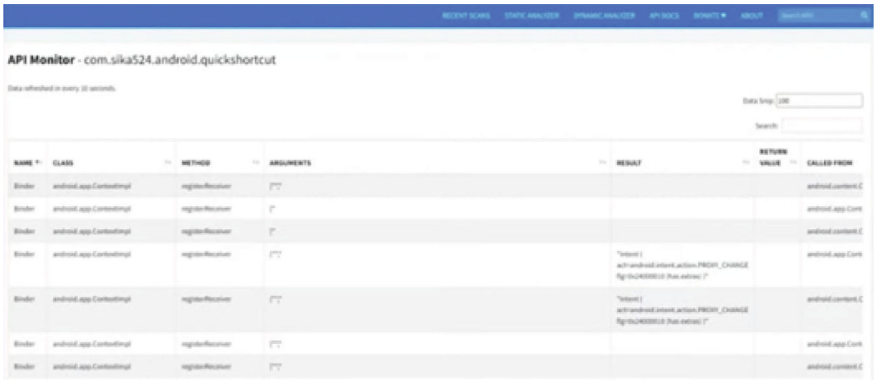


Fig. 13 API monitor

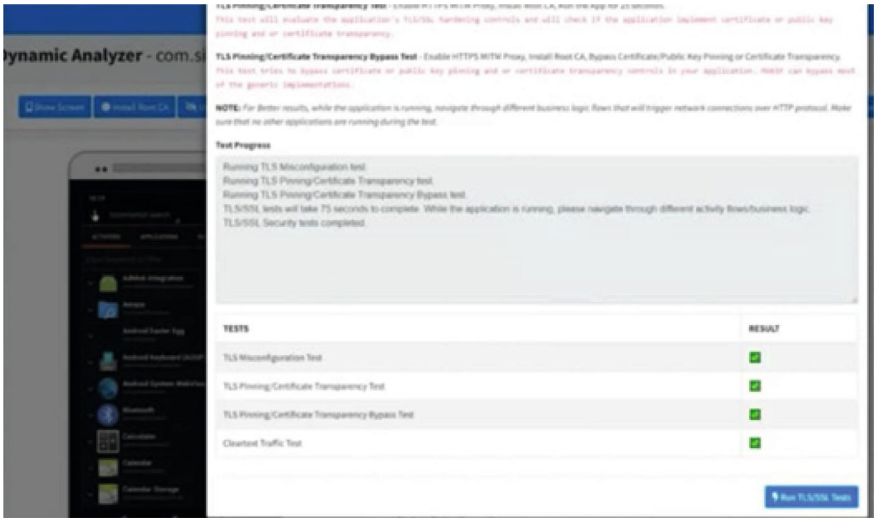


Fig. 14 TLS/SSL tests

5 Performance Analysis

The performance analysis of "QuickShortcutMaker" offers a comprehensive look into its security and issue severity breakdown. The security score of 45 out of 100 suggests that while the app maintains a certain level of security, there's room for improvement to bolster its overall safety and reliability.

Breaking down the severity distribution:

- High severity (2%): This category represents critical issues that require immediate attention. The fact that these comprise only 2% of the total concerns is somewhat reassuring. However, addressing these highseverity issues is paramount to ensure the app's stability and security.
- Warnings (3%): Warnings signify potential concerns that might not be as severe as high-severity issues but still demand attention. With 3% falling into this category, it's essential to investigate and mitigate these warnings to prevent any escalation into more critical problems.
- Informational items (1%): Informational items, while not posing immediate threats, are integral for understanding the app's performance and security. These items contribute to the overall analysis, offering context or details that might aid in enhancing the app's functionality or security measures.
- Secure elements (1%): This category indicates areas within the app that are confirmed or verified as secure. While constituting only 1%, these elements represent sections of the app that meet the desired security standards.

The analysis reveals a positive aspect—most of the issues fall into the less severe categories of warnings, informational items, and secure elements. However,

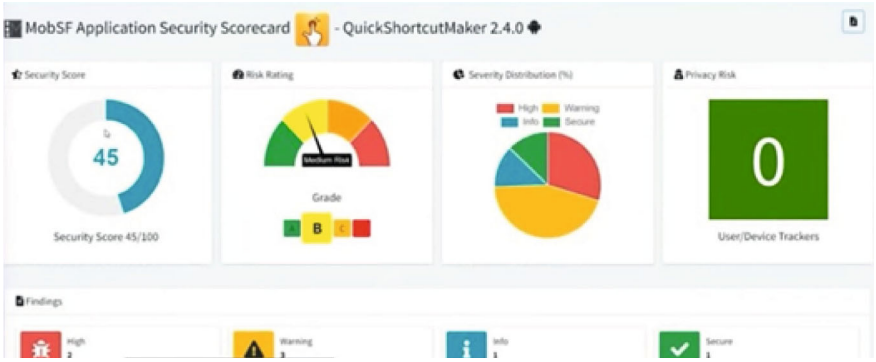


Fig. 15 Performance analysis

it's crucial to focus on resolving high-severity matters promptly to address critical vulnerabilities and ensure the app's stability and security.

To further enhance the app's performance, attention should be given to improving the warnings and informational aspects. Strengthening these areas can prevent potential issues from escalating and contribute to an overall more secure and reliable user experience. Regular security checks and updates can help maintain a safer environment for users and mitigate potential risks associated with the identified concerns (Fig. 15).

6 Related Work

Android malware analysis and detection has seen significant progress in recent years, driven by the escalating threat of malicious applications targeting the Android platform. Researchers and cybersecurity experts have explored various techniques and methodologies to identify, analyze, and combat Android malware. This section reviews key studies and research that have contributed to the foundation of the proposed "Behavioral Profiling of Android Malware" approach, focusing on dynamic analysis:

(i) Dynamic analysis in android malware detection: Dynamic analysis has gained prominence in the domain of Android malware detection due to its ability to capture the actual behavior of an application during runtime. Existing research has explored the value of dynamic analysis in detecting and classifying Android malware, emphasizing its effectiveness in uncovering behavior-based indicators of malicious intent.

- Zhou et al. [11] presented a systematic approach to dynamic analysis, emphasizing the importance of runtime monitoring and behavioral analysis for malware detection.

- Li et al. [12] introduced a dynamic analysis framework called DroidScope, which combines emulation and dynamic taint analysis to capture malware behaviors effectively.

(ii) Instrumentation Techniques in Android Malware Analysis: Instrumentation plays a crucial role in dynamic analysis by intercepting and logging relevant events during malware execution. Dynamic instrumentation frameworks such as Frida offer capabilities to intercept and modify the behavior of Android applications, enabling researchers to instrument malware samples for behavioral profiling and analysis.

- Chen et al. [13] developed DroidTrace, a dynamic instrumentation tool for Android malware analysis, which monitors system calls, API invocations, and network activities.
- Enck et al. [14] proposed TaintDroid, a dynamic taint analysis system that tracks data flow and information leakage in Android applications.

(iii) Machine learning integration: Machine learning techniques have been integrated into dynamic analysis to automate the detection of Android malware based on behavioral patterns. This approach improves the efficiency and accuracy of malware identification.

- Raff et al. [15] utilized ensemble learning algorithms to classify Android applications based on their behaviors, achieving high accuracy in malware detection.
- Kim et al. [16] proposed a hybrid approach combining static and dynamic analysis with machine learning for Android malware detection, leveraging features extracted from both analysis phases.

(iv) Behavioral profiling in android malware analysis: Behavioral profiling is a crucial aspect of dynamic analysis, enabling the creation of profiles that represent the typical behavior of Android applications. Researchers have investigated the utility of behavioral profiling in distinguishing benign and malicious behavior.

- Saracino et al. [17] combined static and dynamic analysis with machine learning to detect Android malware variants, utilizing features derived from both code analysis and runtime behavior.
- Ahmadi et al. [18] proposed a framework for Android malware analysis that integrates dynamic analysis with network traffic analysis and behavior-based detection mechanisms.

7 Discussion

In this paper, we evaluated various methods for detecting Android malware by employing a consistent modeling approach. We meticulously assessed hundreds of samples for each year and compiled a comprehensive summary outlining the vulnerabilities identified in the following analyses.

The Android Malware Analysis in 2018 app dataset, identified through its package name com.qrbarcode.goit.ftth, exhibits a concerning array of vulnerabilities across different risk levels. With a total of 1 count of high-risk, 5 counts of medium-risk, 1 count of low-risk, 2 counts of warning, and 2 counts of information vulnerabilities, the app's security is significantly compromised. Notably, it suffers from severe issues such as insecure communication, insufficiently random values, weak hashing algorithms like MD5, and vulnerable cryptographic signatures like SHA1 with RSA. These vulnerabilities expose critical security flaws in communication protocols, data handling, and encryption mechanisms, making the app susceptible to exploitation and potential data breaches. Moreover, warnings regarding the usage of SU binary and concerns about external storage access pose additional risks. The absence of protection measures against screenshots and copy-paste security for sensitive fields further amplifies the app's susceptibility to potential threats. Users should exercise caution and consider avoiding the use of this app due to its high risk of data compromise and exploitation [19–26] (Fig. 16).

The Android Malware Analysis in 2019 app dataset, labeled under samsungupdate.com, presents an alarming assortment of vulnerabilities spanning various risk levels. This app, version 18.1, possesses a significant threat profile with 1 count of high-risk, 8 counts of medium-risk, 2 counts of low-risk, 3 counts of warning, and 2 counts of information vulnerabilities. Notably, it suffers from critical security flaws, including insecure communication practices observed a staggering 297 times, usage of weak or insufficiently random values in cryptographic operations, improper export of components like receivers and services, and the employment of weak hashing algorithms such as SHA-1 and MD5. Additionally, the app exhibits low-risk concerns like enabling JavaScript in Web View, hardcoded IP addresses, and issues related to external storage access. Warning vulnerabilities encompass insecure Web View settings, potentially risking file access and universal access from file URLs. Information-level vulnerabilities involve a lack of protection against screenshots, and missing copy-paste security for sensitive fields, raising significant concerns for data privacy and integrity. The presence of these vulnerabilities suggests a high likelihood of exploitation and data compromise, warranting extreme caution and potential avoidance of this app. Users should be wary due to the extensive range of security weaknesses inherent in this application (Fig. 17).

The Android Malware Analysis in 2020 app dataset, identified by its package name com.securitymobile.antivirus.applock appears to have a concerning array of vulnerabilities across different risk levels. With a total of 1 count of high-risk, 7 counts of medium-risk, 1 count of waning, and 2 counts of information vulnerabilities, this

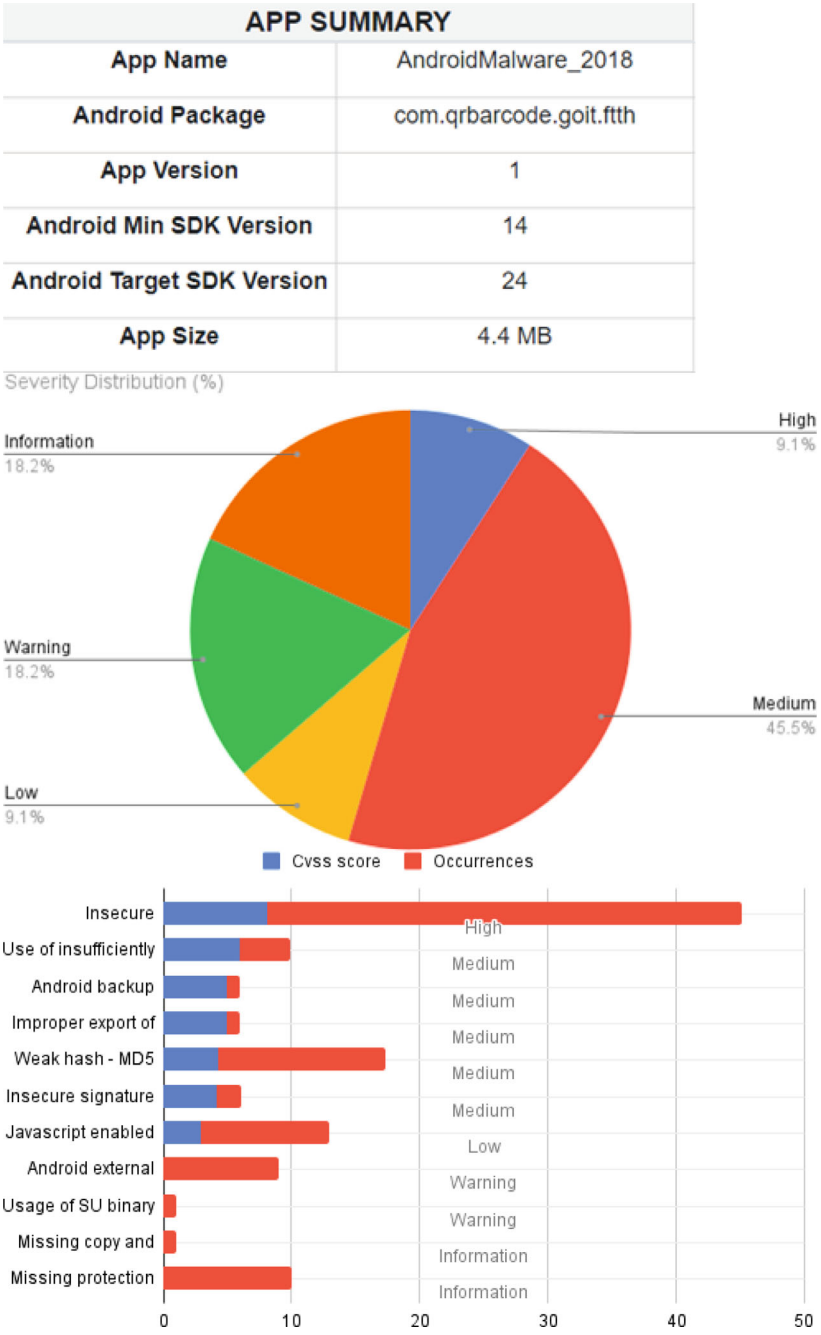


Fig. 16 Android malware analysis in 2018

APP SUMMARY	
App Name	AndroidMalware_2019
Android Package	samsungupdate.com
App Version	18.1
Android Min SDK Version	16
Android Target SDK Version	26
App Size	20.9 MB

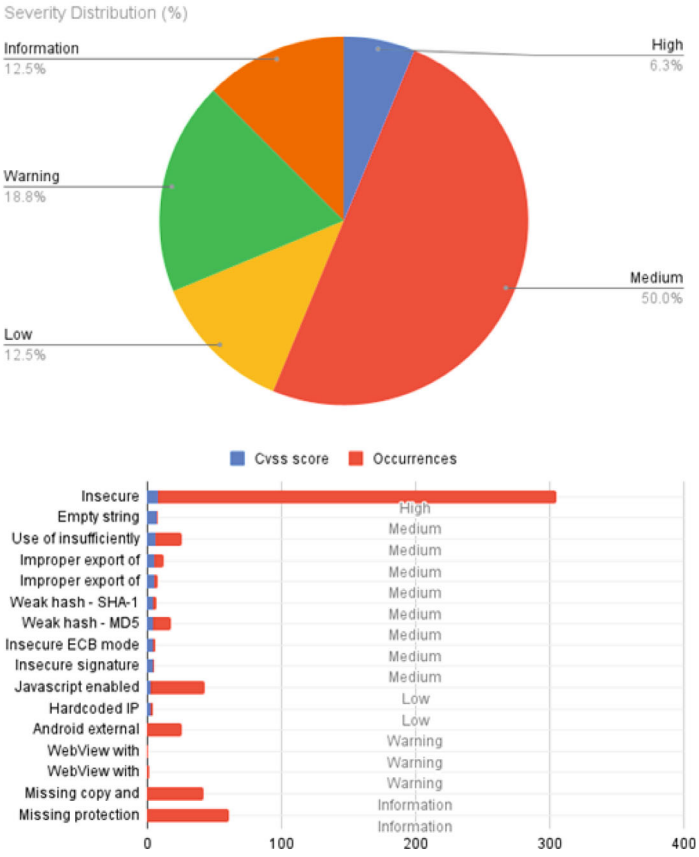


Fig. 17 Android malware analysis in 2019

app exhibits significant security weaknesses. Notably, it suffers from high-risk insecure communication practices, observed 159 times, potentially compromising data integrity and privacy. Medium-risk vulnerabilities include issues like hardcoded passwords, insufficiently random values, improper exports of components like receivers and services, and the use of weak hashing algorithms like MD5 and SHA-1. Low-risk concerns involve enabling JavaScript in Web View, and warnings related to external storage access. Information-level vulnerabilities encompass the absence of copy-paste protection in sensitive fields and a lack of safeguards against screenshot capture. These vulnerabilities collectively highlight substantial risks to user data and system security, raising concerns about potential exploitation and data compromise. Caution is advised when considering the use of this app due to its high-risk profile for potential security breaches (Fig. 18).

The Android Malware Analysis in 2021 app datset, identifiable by the package name app.lite.bot, presents several vulnerabilities across different risk categories. With 1 count of high-risk, 6 counts of medium-risk, 1 count of warning, and 1 count of information vulnerability, this app exhibits noteworthy security concerns. Notably, it suffers from high-risk insecure communication on three occasions, potentially compromising data integrity. Medium-risk vulnerabilities include insufficiently random values, improper export of components like receivers and services, and the use of weak hashing algorithms like MD5 and SHA-1. Additionally, there's a warning regarding Android external storage access. Information-level vulnerabilities involve missing protection against screenshot capture, which could potentially compromise user privacy. While this app shows fewer vulnerabilities compared to others, the existence of high and medium-risk vulnerabilities, especially in communication security and improper data handling, raises significant concerns about potential data breaches and exploitation. Users should exercise caution when using this app due to its security weaknesses (Fig. 19).

8 Conclusion

The persistent threat of Android malware necessitates innovative detection and mitigation solutions [27]. This study proposes a dynamic analysis approach combined with behavioral profiling as an effective method for Android malware identification [2]. Through comprehensive experiments and analysis, significant insights were gained.

We began by collecting and preprocessing a diverse dataset of Android applications, including both benign and malicious samples [28]. In the dynamic analysis phase, applications were executed in a controlled environment, capturing runtime behaviors like system calls, network activities, and resource usage [8]. This dataset formed the basis for our behavioral profiling method.

Behavioral profiling allowed the creation of reference profiles to distinguish normal from malicious behaviors, which were used in a machine learning model

APP SUMMARY	
App Name	AndroidMalware_2020
Android Package	com.securitymobile.antivirus.applock
App Version	1.3.4
Android Min SDK Version	16
Android Target SDK Version	28
App Size	8.5 MB

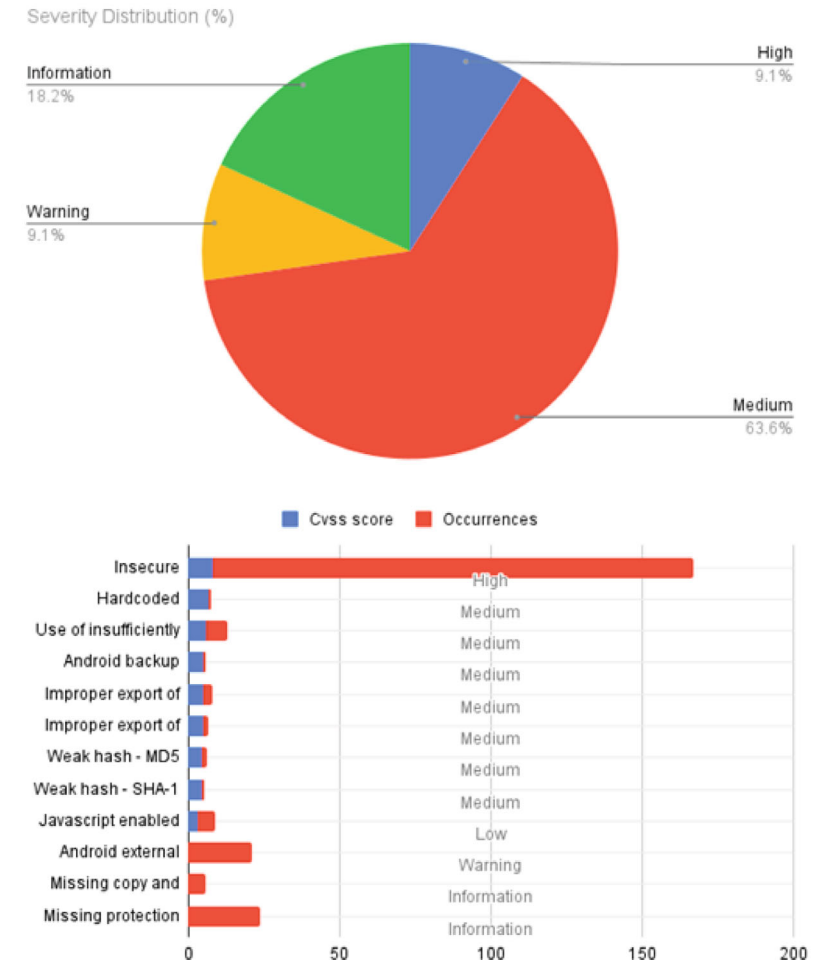


Fig. 18 Android malware analysis in 2020

APP SUMMARY	
App Name	AndroidMalware_2021
Android Package	app.lite.bot
App Version	1
Android Min SDK Version	18
Android Target SDK Version	22
App Size	7.1 MB

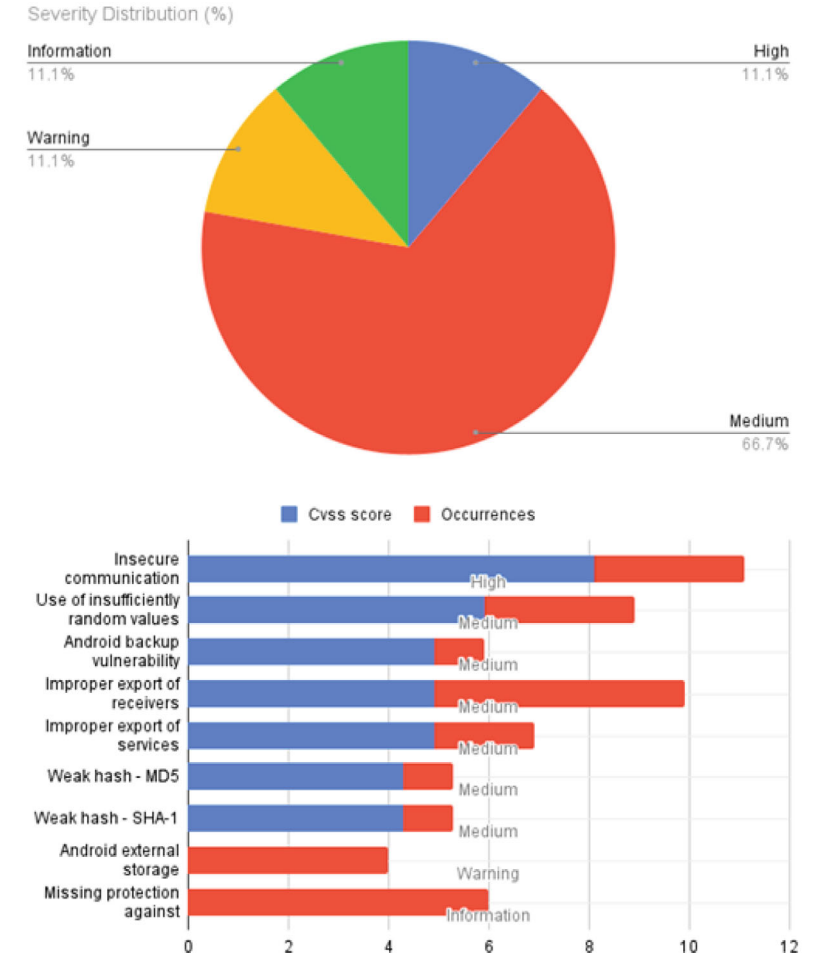


Fig. 19 Android malware analysis in 2021

to classify applications with high accuracy. Our results confirmed the effectiveness of combining dynamic analysis with behavioral profiling for malware detection [2].

Our work also addresses challenges such as scalability, evasion resistance, and real-time capabilities, highlighting the need for ongoing monitoring and updating of analysis methodologies as the Android malware landscape evolves.

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CCSAR—Cloud Computing Security Architecture and Risks



Prakhar Arora, Hemraj Shobharam Lamkuche, Hanan Abu-Mariah, and Ghassan Samara

Abstract In response to the escalating demand for scalable and flexible computing resources, Cloud Computing has emerged as a transformative force in technology deployment. This research paper delves into "Cloud Computing Security Architecture and Risks," exploring the imperative behind adopting cloud solutions. It critically examines strategic frameworks for securing cloud environments and addressing evolving vulnerabilities. The multi-dimensional nature of Cloud Computing Security Architecture, encompassing technologies and best practices, is explored. The ubiquity of the cloud arises from the need for organizations to efficiently manage and access resources, promoting innovation. Advanced security architecture is crucial due to dynamic cyber threats, incorporating robust measures like encryption and threat detection. Cloud adoption mitigates risks, yet data breaches and regulatory compliance challenges persist. The paper aims to bridge theory and practice, offering insights into a safer cloud landscape to guide practitioners and decision-makers.

Keywords Cloud security architecture · Cloud computing risks · Technological progress

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1 Introduction

In today's digital landscape, cloud security architecture and solutions are crucial due to cloud computing's speed, scalability, and cost benefits. This paper explores recent advancements and innovations in cloud security [1], covering topics like Smart Grid security, data processing enhancements [2], and the need for ongoing improvements to address evolving threats [3]. We investigate recent breakthroughs in security strategies [4], data protection, and emerging technologies [5–8], aiming to enhance digital safety [9].

2 Objective

This chapter clearly outlines the main objective of our study, which is to provide a comprehensive and comprehensive study of the complexities of cloud computing and emerging security issues. Our first goal is not only to take a deep dive into the current cloud security framework but also to take a closer look at updated security measures and strategies.

This chapter clearly explains our study's major goal, which is to give a complete analysis of the intricacies of cloud computing and rising security challenges. Our initial goal is to not only dive deep into the current cloud security framework but also to examine updated security measures and techniques. By thoroughly studying the basic architecture of cloud computing, we hope to uncover the competitive texture of hardware, software, and network components. A voyage into the cloud's heart will provide you with insight into how data is stored, transmitted, and safeguarded. At the same time, our research will focus on identifying and analyzing numerous cloud security difficulties, including both operational and technical issues.

Finally, our goal is to offer companies with the insight and knowledge they need to make informed decisions about enhancing air security policies and adapting to the growth of digital threats.

3 Related Works

We present an in-depth and thoughtful overview of previous work in the topic of climate security in this essential section of our research. In addition, we have broadened our research to encompass smart grid development and data optimization research. Our goal is to give readers an overview of advancements in linked fields.

We share major findings and insights from prior research in this review. We carefully select and disseminate the most useful studies, each of which provides unique insights and solutions to difficult difficulties in cloud security, smart projects, and data optimization.

Our research is built on the vast information and empirical work obtained from earlier investigations. We can monitor growth and look ahead to improve cloud security and smart planning and actions around information work by recognizing these studies and gleaning insights from them.

3.1 Security and Efficiency Enhancements in Smart Grid and Data Processing

In this critical section of our research, we engage in an in-depth examination and thoughtful discussion of the existing body of work within the domain of cloud security. Furthermore, we broaden our scope to encompass research pertaining to the enhancement of smart grid systems and data processing efficiency. Our objective is to provide readers with a holistic perspective on the strides made in these interrelated fields.

By conducting this review, we shine a light on notable contributions and insights from previous studies. We carefully identify and highlight the most influential research endeavors, each offering unique perspectives and solutions to the complex challenges in cloud security and the optimization of smart grid and data processing.

The wealth of knowledge and experience gleaned from these prior works forms the bedrock upon which our research is built. By acknowledging and synthesizing the insights derived from these studies, we can envision a more comprehensive and forward-thinking approach to the enhancement of cloud security and the augmentation of smart grid and data processing efficiency.

Cloud Computing Applications for Smart Grid

Application	Cloud computing applications	Future research directions
Cloud data warehouse (as in)	Multidimensional data analysis in smart grid	• Define proper access control mechanism for cloud data warehouse to support smart grid architecture • Establish co-ordination between smart grid and cloud data warehouse • Build a software platform which support unified data management for smart grid environment
Information management cloudward (as in)	Different domains for cost effective information management cloudward	• Define a cloud-based model which support all domains simultaneously

(continued)

(continued)

Application	Cloud computing applications	Future research directions
Net-AMI infrastructure (as in)	Cloud computing infrastructure for communication and information optimization	• Define a proprietary protocol for cloud computing to support Ethernet for net-AMI architecture in smart grid • Implement secure and privacy communication mechanism using cloud based net-AMI infrastructure in presence of radio waves
Smart meter data streams in cloud (as in)	Cloud acts as infrastructure as a service for processing smart meter data	• Guaranteed work-flow latency and processing rates with the help of cloud data optimization
Smart grid data cloud (as in)	Realtime distributed data management and parallel processing of information using data cloud	• Dynamic pricing model in smart grid architecture according to load on cloud data services
Dynamic data center operations (as in)	Storing the real-time data on cloud, and served the data as internet data centers (IDC) to users	• Implementation of secure data storage mechanisms to preserve the privacy of the users • Proposing adequate data transfer framework from users to cloud and vice-versa

3.2 Innovative Approaches to Enhance Cloud Security and Data Privacy

Blockchain and cloud computing integration has emerged as an attractive frontier in the technology landscape, promising a perfect blend of decentralized [2] security and scalable data management. By using the benefits of both blockchain and cloud computing, Singh et al. [10] this convergence has the ability to change industries, redefine data integrity, and fuel creativity (Fig. 1).

Blockchain's Foundational Trust: Blockchain, the technology behind Bitcoin, ensures a secure, tamper-proof ledger where transactions are encrypted and distributed across nodes [10]. Its immutability and transparency enhance authentication and security [9].

Cloud Computing's Scalable Realm: Cloud computing offers scalable, on-demand resources over the Internet, transforming data storage and processing [5]. This scalability, cost-effectiveness, and convenience redefine business and individual operations [11].



Fig. 1 Blockchain cloud computing

Elevating Data Security and Integrity: Blockchain strengthens cloud security through decentralization, eliminating single points of failure and utilizing cryptographic hashing and consensus mechanisms to ensure data integrity and protect against unauthorized alterations [12, 13].

Optimizing Supply Chain Management: Integrating blockchain with cloud technology improves supply chain management by enabling real-time tracking, verifying goods, and handling large data volumes, which increases transparency and streamlines logistics.

3.3 Security Strategies and Case Studies in Cloud Computing: Enhancing Data Protection and Resilience

Omer et al. [14] present research data that includes a total of 21 field interviews conducted in Australia and a survey of 480 IT workers from 47 regional states in Australia. Therefore, this article covers information security, risk assessment, etc. [7]. It introduces a cloud information security model that supports and thus enables the unified and secure use of cloud services in the network. This research paper found strong evidence of the above factors affecting cloud cover not only in Australia but also in other countries and governments. The results may form a basis for further investigation and research. Confidentiality, integrity and availability are fundamental concepts of data security and management. Ahmed et al. [6] focused on one of the main attacks; the most dangerous being distributed denial of service. In this case, the attack may come from a single source or device, or sometimes it may come from more than one source and cause malfunctions. This DDoS is divided into Bandwidth and Resource Usage. EDoS is the first form of DDoS attack [15]. Many solutions fall into our conservation, detection and restoration categories. DDoS protection includes Moving Target Protection, CAPTCHA, Anti-Doping, Service Quotas, DNS-based technologies and more. DDoS Detection Controls include: Bot Cloud Detection, Signature-Based Detection, and Malicious Detection Therefore,

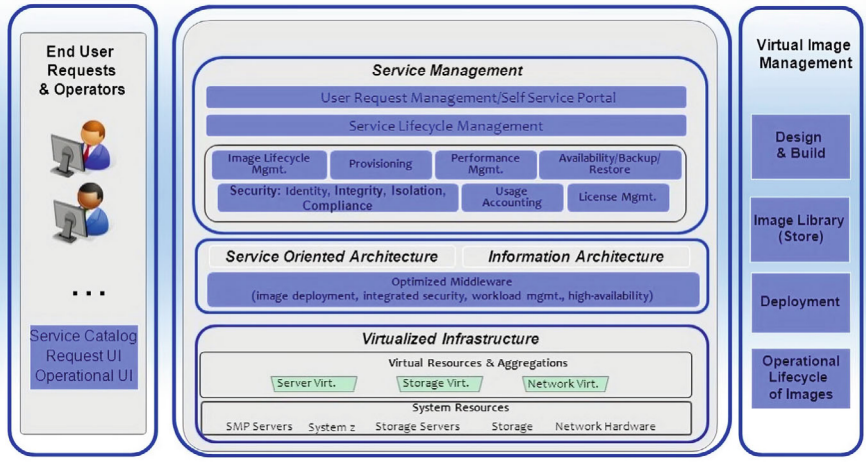


Fig. 2 Proposed architecture

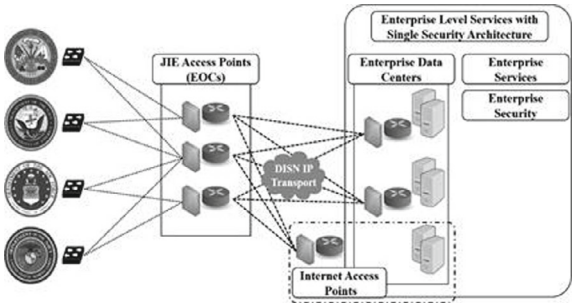
we need to create more robust systems based on DDoS tolerance that causes these attacks [16]. Anamika et al. [17] focused on CIA, the main concepts of information security in the cloud; these are confidentiality, integrity and availability (Fig. 2).

Isaac et al. [18] discusses the successful architecture and deployment of cloud computing. It is a simple pool of shareable resources that allows remote access to remote network storage, servers, files, and other flexible resources [1]. There are many cloud specific standards, and many are still under development, they are NIST and have five major players: Customer, Service Provider, Auditor, Broker, Carrier. Most cloud services include: SaaS a service that provides users with software applications managed by a cloud service provider, PaaS meaning the hardware and application software platforms are provided and managed by the external cloud—Service and IaaS—this means the cloud provides services to: Manage the process for you, including real servers, network, virtualization and data storage paper. In addition, the infrastructure in the sector is divided into two: private cloud, public cloud, community and hybrid cloud. In short, the security architecture of cloud computing is cloaked in complexity, a symphony of written instructions and visualization. These events orchestrate a harmonious dance between the security and inadequacy of the cloud [18]. They maintain a good strategy, a constant cycle of change and change in response to threats and emerging problems. Ultimately, these designs allow organizations to embrace the changing climate without compromising the sanctity of their digital environments [19–22].

4 Methodology: Securing the Digital Realm

4.1 Evolving Landscape

In the evolving field of cloud computing, security is crucial, mirroring the role of physical architecture in addressing environmental challenges [12, 13]. Cloud security architecture involves designing robust defenses to protect sensitive data from digital threats such as intrusions and data theft [6, 23]. This dynamic framework must adapt to new attack surfaces and integrate advanced technologies like firewalls, intrusion detection systems, and encryption [6]. As cloud security evolves, it requires continuous updates and alignment with high cybersecurity standards.



4.2 Fortified Security Dimensions

A deeper look at the security aspects of this model reveals the science of different systems designed to encrypt, identify, monitor and block unauthorized access attempts. These security measures include advanced firewalls, access control, encryption systems, and granular access controls that together act as guardians of this digital fortress [6]. This model ensures that data is always alerted and protected against external attacks and internal vulnerabilities [6].

At the heart of cloud computing security architecture are well-designed guidelines for navigating the complex environment. Configure cloud-based events and functions. The architecture takes a comprehensive approach that covers all dimensions, from identity and management to the technology and control library designed to protect applications and data from adverse attacks through threats.

erateAccessLog(user, resource, ”denied”)

function logAuthenticationFailure(user): gener- ateAuthenticationLog(user, ”failed”)

function getUserRoles(user): // Retrieve roles associated with the user from a database or system

[24] function getResourceRoles(resource):// Re-

Play a key role in virtual connections from users and devices to resources, Identity and Access Management (IAM). The architecture is intricately designed with mechanisms to ensure that only authorized sites are accessed [18]. It integrates authentication, authorization and multiple authentication methods, creating a powerful digital gateway that prevents unauthorized access. As cloud services become an integral part of today's operations, the inclusion of security standards is critical. The architecture leads to a process that seamlessly integrates security into the entire cloud service lifecycle. It creates a way to increase security during the launch, deployment and regular operation of the service. This approach creates a security-by-design culture where all aspects of cloud operations focus on protecting.

In this architecture, law and management take the lead. They set the tone for the entire security disclosure by setting the rules and boundaries that govern cloud participants' interactions. Policies [1] define expectations and determine what to do and what not to do, while management oversees policy implementation to ensure that security and performance are in sync. Comprehensive cloud computing security system pseudo code.

functionauthenticateUser(username,

password):hashedpassword= hash(password)storedpassword= getStoredPassword(username)

if hashedpassword == storedpassword :

returntrueelse: returnfalse

function accessCloudResource(user, re- source): if authenticateUser(user.username, user.password): if hasPermission(user, resource): grantAccess(user, resource) else: logAccessDe- nied(user, resource) else: logAuthenticationFail- ure(user)

function hasPermission(user, resource): user- Roles = getUserRoles(user) resourceRoles = ge- tResourceRoles(resource)

for role in userRoles: if role in resourceRoles: return true

return false

function grantAccess(user, resource): gen- erateAccessLog(user, resource, "granted") provideResource(user, resource)

function logAccessDenied(user, resource): gen-

trieve roles associated with the resource from a database or system

5 Enhancing Cloud Security: Solutions and Innovations

The developing digital ecosystem always brings new issues in the domain of cloud security [11]. This section digs into a variety of unique solutions aimed at addressing specific cloud security issues, with a special emphasis on data de-duplication. We investigate existing algorithms such as C4.5 and ID3 and propose adjustments to improve their effectiveness (Fig. 3).

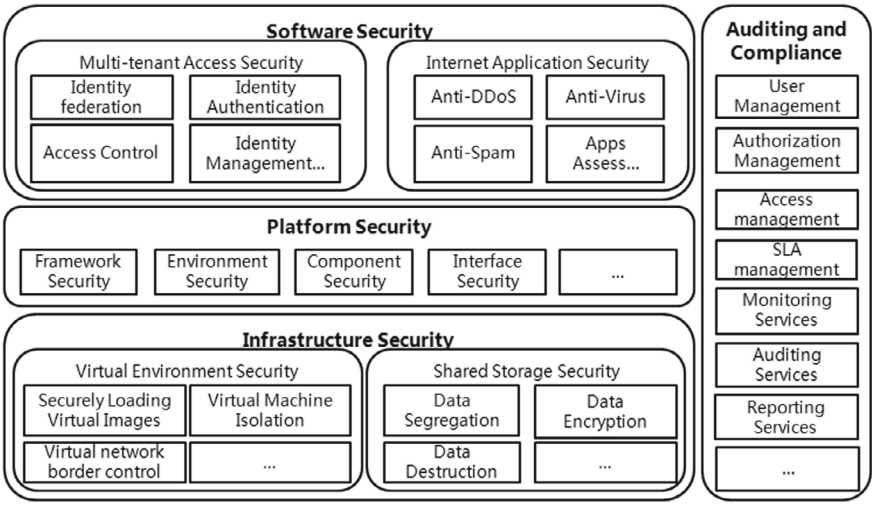


Fig. 3 Security architecture

5.1 Data De-duplication: A Vital Concern

Data deduplication is an important issue for cloud security. It includes identifying and removing suspicious data, improving storage, and reducing the risk of data breaches [17]. In our research on this topic, we touch on many important solutions and offer our own ways to improve them further.

In this comprehensive review of this topic, we dive deeper into the key concepts and challenges of cloud outsourcing [25].

We emphasize the importance of this application in terms of ensuring data integrity, efficient use of resources and preventing abuse.

5.2 Noteworthy Solutions and Innovations

Several notable solutions have emerged in the cloud security arena to address the crucial issue of data duplication. These methods span from algorithmic approaches to encryption techniques, to strengthen cloud data storage and access.

5.3 Algorithmic Innovations

C4.5 Algorithm: Lu and Chen [8], the C4.5 algorithm is effective for creating decision trees with both continuous and discrete data, though it faces challenges with general

and specific features [26]. To address these, we propose enhancing C4.5 using data gain and gain rate, aiming to improve its efficiency with complex data [27].

ID3 Algorithm: Jin et al. [28], the ID3 algorithm, similar to C4.5, focuses on the information most relevant to outcomes. It utilizes entropy to measure uncertainty in datasets [29]. Our analysis explores its benefits and applications in cloud security.

Security Standards in PaaS: Security standards in Platform as a Service (PaaS) support secure development through robust authentication, coding practices, and container security, ensuring application resilience.

Security Standards in SaaS: In Software as a Service (SaaS), security focuses on user experience with integrated encryption for data at rest and in transit, and centralized authentication and access control to safeguard data.

6 Proposed Solution for Data Deduplication

We propose a two-stage approach to enhance cloud security. The first stage involves consistency analysis, where data content is compared using cosine similarity to identify and remove redundant entries. The second stage focuses on encryption, applying RSA technology to encrypt the remaining data with a private key, ensuring its secure storage. This method improves data security and reduces backup storage needs, thereby optimizing cloud security. The approach also addresses evolving cloud security challenges, ensuring data confidentiality and integrity while adapting to changing accountability models and new security features (Fig. 4).

It is also important to know that the responsibility model is not a static but an evolving framework. Cloud service providers (CSPs) regularly introduce new security features and services, which can lead to liability. To ensure a safe environment,

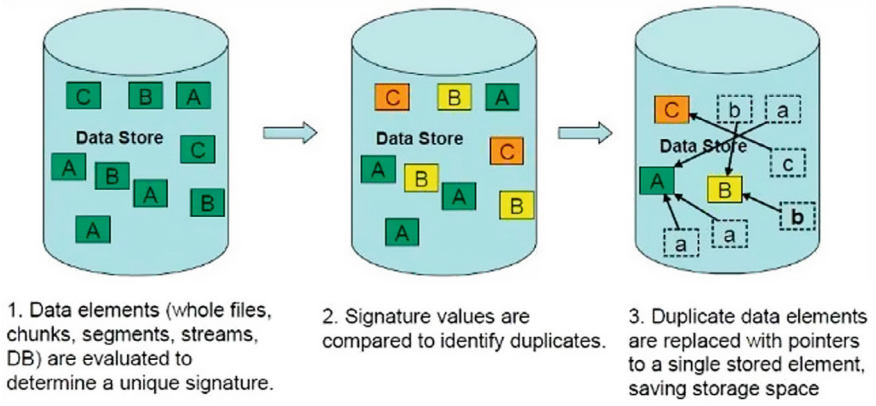


Fig. 4 De-duplication

organizations need to be vigilant and aware of changes to this standard. By understanding and implementing the accountability model, organizations can explore the complexities of cloud security, avoid misunderstandings about who is responsible, and ensure security managed by CSPs and customers.

7 Emerging Solutions and Technologies

7.1 Evolving Landscape of Cloud Security

Evolving Landscape of Cloud Security:

Deployment of algorithmic solutions plays an important role in cloud security. The proven C4.5 algorithm, known for its expertise in creating decision trees that can handle both continuous and discrete events, remains effective [28]. However, because information entropy is limited, problems arise when dealing with its generality and specificity. To solve these problems, our research proposed a modification strategy that uses data gain and gain ratio as key components. This enhancement is designed to reduce C4.5's shortcomings while increasing its effectiveness in handling variable and complex data.

7.2 Integrating Blockchain and Cloud Security

Emerging technologies are beginning to transform cloud security. Blockchain, which is well-known for its involvement in cryptocurrencies, Singh et al. [10] presents a distributed and tamper-resistant ledger. Cloud computing and blockchain complement one other in a symbiotic relationship. In the cloud, blockchain answers concerns about security and transparency, while cloud computing offers the computational power and storage required for blockchain's resource-intensive processes.

The evolving cloud security landscape, driven by sophisticated algorithms, blockchain integration, data de-duplication, and advanced access control mechanisms, underscores the dynamic nature of cloud security [14, 30]. These advancements are crucial for maintaining the confidentiality, integrity, and availability of data in cloud environments. The ID3 algorithm, like C4.5, is pivotal in decision-tree classification, using entropy to measure data uncertainty and feature relevance. Effective cloud security architecture necessitates complex processes to safeguard resources and information, enabling organizations to confidently navigate the complexities of cloud computing (Fig. 5).

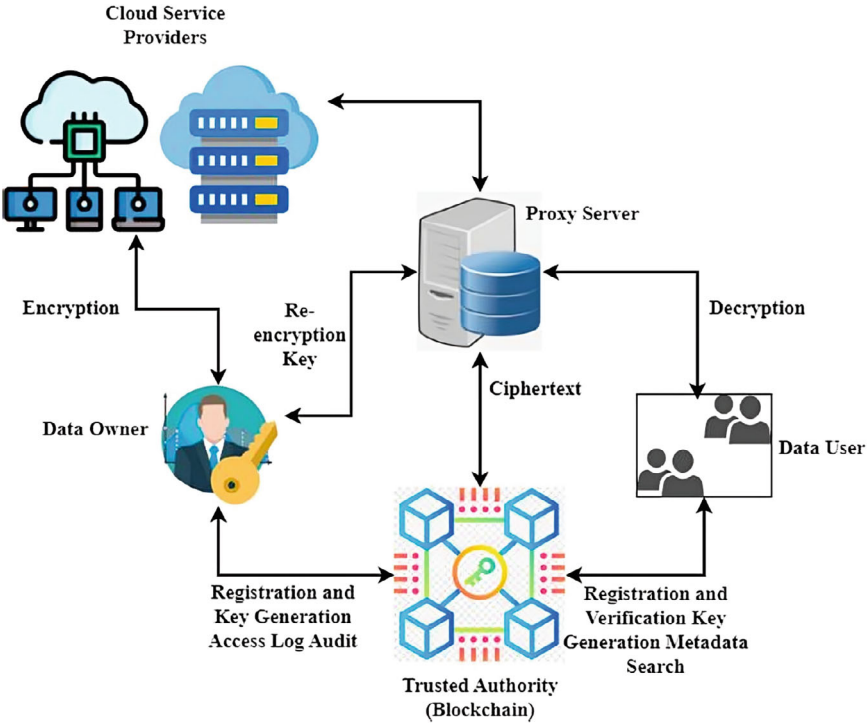


Fig. 5 Control enabled blockchain (ACE-BC) frame-work to manage data security

8 Research Contribution

In this section, we will present the main results of our research and examine the fascinating field of cloud security. Our research is dedicated to exploring the complexity of cloud computing by establishing new methods and creating security solutions to solve today's problems from digital no. around the world. According to our research culture, our most important goal is: Through research and experimentation, we strive to improve the current environment in cloud security and make it protect the threats and problems that arise in the digital world strong castle. Using the latest technologies and best practices, we strive to improve the virtual world in the cloud and ensure that it remains in a secure environment that is stable and adaptable to changing technologies. Please feel free to let me know if you need more details or updates.

8.1 Objective 1: Enhancing Cloud Security Architecture

Our research strives to play an important role in the further development of cloud security architecture. In a rapidly changing environment where threats and vulnerabilities continue to emerge, we focus on improving existing security systems that support cloud computing. This commitment stems from a deep understanding that cloud security is vital in today's age.

Our main goal is to make architectures stronger, make them more capable and responsive to threats and problems caused by changes and the changing digital environment. To this end, we use advanced technology that allows us to adapt, respond and stay one step ahead of those who try to exploit vulnerabilities in the cloud environment. To achieve this, we use the most advanced technologies available as well as best practices developed over the years in cloud security. By integrating these elements, our goal is to create a virtual powerhouse in the cloud that protects sensitive data and digital assets from threats. Our research goes beyond the traditional boundaries of cloud security. It explores new paths, good ideas, and cutting-edge solutions that have the potential to shape the future of cloud security. We know that the process of protecting the cloud environment is not sufficient against today's many threats. That's why our approach includes a combination of innovative technologies designed to solve today's problems. This commitment to innovation continues to integrate intelligent planning and data processing that brings new benefits to cloud security. By leveraging the power of this technology, we aim to create new security strategies that are not only effective, but also effective in data management, ensuring better and more honest data. Together, our research represents an important step towards data management, optimizing processes and providing data. Cloud security response. This is due to the fact that cloud security architecture must constantly evolve to protect against emerging threats. This commitment to progress is at the heart of our research, and we will continue to work to improve the security of the cloud environment and pave the way for security for the digital future.

8.2 Objective 2: Novel Security Solution

Our research aims to advance cloud security architecture in a rapidly evolving digital landscape. Recognizing the critical importance of robust cloud security, we focus on enhancing existing systems to better respond to emerging threats and vulnerabilities. By integrating advanced technologies and best practices, our goal is to build resilient cloud architectures that protect sensitive data and digital assets. Our approach extends beyond traditional security measures, exploring innovative solutions and new strategies to address contemporary challenges. This commitment to innovation and intelligent planning is central to our efforts to improve cloud security and ensure effective data management. Through ongoing advancements, we strive to create a secure and adaptable cloud environment, paving the way for a safer digital future.

We aim to enhance cloud security by refining the C4.5 algorithm and incorporating data gain improvements to address entropy issues. Our research also evaluates the ID3 algorithm's use of entropy. By focusing on deduplication and advancing cloud security techniques, we strive to improve data management and performance. Our self-motivated work addresses current challenges and explores new solutions in cloud security.

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Contrastive Analysis of Arabic-English Translation of Legal Texts



Wafa Abu Hatab, Malek Batran and Mohammed Al-Badawi

Abstract Extensive knowledge of both the legal systems and terminology in the source and target languages is crucial in the specialized field of legal translation to guarantee precision. This study aims to conduct a comparative analysis between Arabic legal texts and their English translations, specifically focusing on excerpts from El-Farahaty's book Arabic–English–Arabic Legal Translation (2015). Despite the paramount importance of accuracy in legal translations, certain errors were identified in some of the translations presented in this book. These errors encompassed over-translation, omission of key terms, inappropriate word choices, superficial translations, misunderstandings, literal translations, punctuation mistakes, and grammatical errors. To address these challenges, it is essential to employ Newmark's (1998) proper translation method, which ensures faithfulness to the original text and accuracy in legal translations. The findings of this study underscore the necessity of meticulous review and consultation with experts to achieve a well-executed legal translation.

Keywords Forensic linguistics · Narrative resistance · Casey Anthony trial · Police interviews · Speech act theory

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1 Introduction

Legal texts encompass a wide array of written materials, such as employment contracts, official circulars, business agreements on both national and international scales, marriage and birth certificates, graduation diplomas, and job applications, among others. The translation of legal texts falls under the category of technical translation due to the specialized and technical language employed in these documents. Given that legal systems and terminologies differ from one country to another, a competent legal translator must possess a comprehensive understanding of the legal systems and terminologies in both the source and target languages to ensure the accuracy of the translation [1]. Accuracy plays a paramount role in legal translation, necessitating the precise translation of every word in the source text. Attaining the highest level of formal correspondence possible in legal translations is often of utmost importance.

Compared to other fields of translation, legal translation has received relatively little attention in research, possibly because it is often categorized as a subset of technical or specialized translation. Legal texts hold a unique and revered status due to their binding nature, similar to sacred texts. This reverence demands a strict adherence to literal translation in order to avoid errors, as [1] emphasized by: "Just like the word of God in religious scriptures, the letter of the law also requires a strict literal translation to safeguard it from any misinterpretation." In this study, the researchers argue that the concept of faithful translation is the most suitable approach for legal texts, as it ensures that every word in the source text is accurately conveyed in the target language while preserving the original meaning [2].

There is a scarcity of books focused on the translation of legal texts between Arabic and English, or vice versa. Only a few publications exist in this field, including works by [3–5]. Among these options, El-Farahaty's book, Arabic–English–Arabic Legal Translation, was chosen for several reasons. Firstly, the researcher was tasked with teaching a legal translation course at the Department of Foreign Languages at the University of Nizwa during the Fall Semester of 2020. In preparation for the course, the researcher obtained an electronic copy of El-Farahaty's book and carefully selected relevant sections. This particular book was chosen because it offers a comparative approach to Arabic-English and English-Arabic legal translation, providing detailed insights into the characteristics of both legal English and legal Arabic [6]. Secondly, the book comprehensively outlines the various stages of translation, with a specific focus on legal translation. It also extensively references previous research on legal translation, making it a valuable academic resource [7]. Lastly, during the teaching process, the researcher identified errors in the source texts, as well as in the translations provided by the book's contributors and those suggested by El-Farahaty. To emphasize the significance of precision in legal translation, the researcher made the decision to perform a comparative examination of English legal texts and their translated versions. The purpose was to bring attention to substantial mistakes that impact the intended meaning and accuracy [8]. The researcher possesses extensive expertise as an

academic and professional translator, specializing in the translation of Arabic-English and English-Arabic texts, particularly in the legal field [3, 4].

1.1 The Objectives of the Study

Given the limited research on the contrastive analysis of Arabic-English translation of legal texts, this study aims to address this gap by examining a sample of legal texts in Arabic and their English translations. The specific objectives of the study are:

1. To conduct a contrastive analysis of the selected legal texts.
2. To identify errors in the translations of these legal texts.
3. To propose accurate translations for the legal texts under review.

1.2 The Statement of the Problem

This research study aims to address the following questions:

1. Are the translations of the selected legal texts accurate?
2. What errors are present in the translations of these legal texts?

2 Literature Review

In this section, we will provide a comprehensive overview of the existing literature concerning the translation of legal texts, with a specific focus on Arabic-English and English-Arabic translations. The aim is to explore the various aspects and challenges that arise when translating legal documents in both directions. To maintain brevity, recent studies have been chosen to provide insights into the most up-to-date research, although it is important to note that there are numerous earlier works of significance within the literature. Furthermore, this review emphasizes the suitability of Newmark's faithful translation method as the theoretical foundation for this study [9].

2.1 Studies on Legal Translation

In a study conducted by [10], the focus was on the translation of legal documents from Australian English to Italian. It was proposed that cultural legal terms should be treated as proper names due to the immense difficulty or even impossibility of

translating these terms accurately. This study differs from the present research, which centers on the precision of English translations of Arabic legal texts and emphasizes the importance of maintaining faithfulness in translation rather than considering cultural terms as untranslatable.

The evaluation conducted by [11] assessed the effectiveness of Google Translate in translating English legal texts into Arabic. This analysis involved the examination of six legal contracts, consisting of fourteen English articles. The findings of the study revealed that Google Translate only offered rough translations that lacked the essential syntactic and lexical precision required for legal documents [12]. In contrast to Hijazi's emphasis on machine translation, the current study investigates human translations and incorporates a cultural analysis. To identify translation errors, a contrastive analysis approach is employed.

In his study, [8] delved into the translation of five Arabic marriage contracts into English and discovered that a word-for-word translation often resulted in ambiguous interpretations of culture-specific terms. As a solution, he suggested adopting functional and communicative approaches. While both studies focused on the translation of legal texts from Arabic to English, the current research explicitly supports Newmark's faithful translation method as the most effective approach.

In a study conducted by [12], an exploration was undertaken on the translation of legal texts, considering both intralinguistic and interlinguistic aspects. The study reached the conclusion that legal translation is a multifaceted process, influenced by various factors such as culture, language, and law, and heavily reliant on the intended audience and their legal backgrounds. Although Gotti's findings support the current study's perspective on the intricate nature of legal translation, it is worth noting that the scope and language combinations in the two studies differ.

The analysis conducted by [4] delved into the inaccuracies present in the English translations of twelve Arabic contracts. This examination revealed a multitude of errors, encompassing linguistic, stylistic, and cultural aspects, which ultimately led to translations that were both ambiguous and incorrect. Although the current research expands beyond the scope of Alrikabi's study by encompassing a wider range of legal texts such as contracts, official documents, and speeches [5], both studies share a common ground in their identification of similar types of translation errors.

The examination conducted by [5] delved into the obstacles encountered when translating English legal documents into Arabic. This research identified various challenges, including lexical features, connotative and contextual meanings, differences within the legal system, and a lack of familiarity with legal terminology. The current study, unlike Altarabin's broader exploration, adopts Newmark's faithful translation method as its theoretical foundation. Consequently, some of the difficulties outlined by [7] can be attributed to the translation errors uncovered in this present study.

In the work of [6] the authors presented a comprehensive breakdown of eight distinct translation methods, including word-for-word, literal, faithful, semantic, adaptation, free, idiomatic, and communicative translation. The researcher

asserts that when it comes to legal texts, faithful translation is the most appropriate approach. According to [7], faithful translation strives to faithfully reproduce the precise contextual meaning of the original text while adhering to the grammatical structures of the target language. This method ensures the preservation of the meaning of each word in the source text, which is crucial for maintaining legal equivalence [12]. To achieve accurate and legally equivalent translations of Arabic legal texts into English, the adoption of faithful translation is proposed.

3 Methodology

3.1 Data Collection and Procedure

The analysis for this research was conducted using data extracted from Arabic–English–Arabic Legal Translation. A total of ten legal texts written in Arabic, covering a range of topics and varying in length, were selected for examination alongside their corresponding English translations. It is important to note that while El-Farahaty's book encompasses both Arabic-English and English-Arabic legal translations, this study specifically focuses on the Arabic-English aspect to maintain a narrower focus. The legal texts utilized in this study were obtained from various sources that specialize in legal translation, such as [11, 13]. In cases where existing translations were not available, El-Farahaty provided her own translations. To facilitate a comprehensive visual analysis of the source and target texts, the researcher developed a contrastive analysis table.

3.2 Data Analysis

To analyze the discrepancies between Arabic texts and their English translations, the researcher devised ten tables for contrastive analysis. Each table was comprised of three columns: one for the original text, one for the translated text, and one for the researcher's translation utilizing faithful translation approach. This structure enables readers to easily detect any inaccuracies present in the translated texts. Drawing upon his extensive translation expertise, the researcher also provided exemplary translations of the original texts for comparison. Through the process of contrastive analysis, it became apparent that the translated texts contained significant lexical errors, thereby compromising the overall quality of the translations and distorting the intended meanings, ultimately resulting in unfaithful renditions.

4 Results and Discussion

After examining the data provided by El-Farahaty in her work on Arabic-English-Arabic Legal Translation, the researcher carefully studied both the original texts and the translated texts. The translated texts were either done by El-Farahaty herself or obtained from other sources. Employing Newmark's theory of faithful translation, the researcher analyzed these texts. In order to identify any errors in the translated texts, the researcher created tables for contrastive analysis, which included the original texts, the translated texts, and the researcher's own faithful translations. These tables serve the purpose of providing readers with a comprehensive overview of the study's findings, which will be discussed in detail later on.

In Table 1, the initial source text includes the Arabic term "سيادة," which carries the meaning of "sovereignty" in English. Surprisingly, the translator overlooked the translation of this pivotal term, disregarding its substantial legal and political significance. The author should have recognized this omission as an error. Table 1 displays the original source text, the translated text, and the researcher's accurate rendition for comparison purposes.

Two translation errors are evident in the second target text, resulting in an inaccurate representation. Firstly, the translator mistakenly translated the Arabic term "الرسل" as "apostles," which does not fully capture the intended meaning of the religious term. The accurate translation should have been "messengers." Secondly, the target text includes an extra word that does not exist in the original Arabic text. This overtranslation introduces a nonexistent word into the target text, which is a major issue and unacceptable. Surprisingly, the author of the book did not address this significant error and failed to critique the translator's decision to add a word that was not present in the source text.

The Arabic phrase " وتجفيف مصادرها الفكرية "was translated into English as "and drying out of its cultural and intellectual wells." The addition of "cultural," lacking a counterpart in the original Arabic phrase, cannot be justified. Table 2 presents the second source text, the target text, and the researcher's faithful translation for comparison [14].

It is clear to those who are fluent in both Arabic and English that the translator made a mistake by including the English adjective "cultural," which does not exist in the original Arabic phrase "ثقافية." Even a minor oversight can result in significant disparities, particularly in sensitive texts such as legal or political documents.

Table 1 Translation of ST

Source text 1	Target text 1	Researcher's faithful translation
يجب عِلى كِل مِواطن أنِ يحِمي ويِصون استقلالِ البلاد وسيادتها وِسلامة ترابها الوطني ... [4]	The duty of every citizen is to protect and safeguard the independence of the country and the integrity of its national territory. (ibid)	Every citizen must protect and safeguard the independence and sovereignty of the country and its national territory

Upon examination of the third target text, it becomes evident that there are two instances of over translation. Despite the source text being concise, the translator included two elements in the translation, one of which modifies the original meaning and the other appears to be redundant. The verb "يؤدي" in the source text means "result in," not "may result in" as translated. The addition of "may" changes the certainty expressed in the source text from a factual statement to a possibility. When it comes to legal translation, it is crucial to remain faithful to the source text and its intended meaning. Any addition, deletion, or modification can not only alter the meaning but also give rise to disputes, some of which may be significant and difficult to resolve [10, 11, 13].

In addition, it is unnecessary and repetitive to include the adjective "genocidal" before the word "annihilation" in the recreated text. The Arabic term "إفناء" translates directly to "annihilation" in English, without the need for any additional qualifiers. The authoress of the book should have recognized and rectified these mistakes, particularly given the book's emphasis on precise and faithful legal translation. Table 3 displays the original source text, the recreated text, and the researcher's accurate translation for comparison purposes.

The author's fourth target text contains several notable inaccuracies that compromise its faithfulness to both the original text and the target language. One such error is the incorrect translation of the Arabic phrase "زملاؤكم الوزراء" as "colleague ministers," which creates an awkward construction in English as both "colleague" and "ministers" are nouns. A more accurate rendition of the Arabic phrase would be "fellow ministers," where "fellow" serves as an adjective modifying "ministers".

In a similar vein, the English translation of the phrase "وما اتقليدكم المسؤولية إلا" was inaccurately rendered as "It is nothing but an appreciation." The translator opted for a gloss translation, modifying both the intended meaning and structure of the original phrase. A faithful translation of the Arabic expression would be "Granting you this responsibility is merely a gesture of appreciation.

The author made an error in translating the Arabic term "دولة" as "wise" and failed to find a suitable English equivalent for the adjective "محنّك". A more accurate translation would be "resourceful". Similarly, the phrase "كفاءاتكم" was inaccurately translated as "your skills" instead of "your competence". The same mistake was made with the translation of "مهارة" as "skill" instead of "competence". Additionally, "in the field of teaching and learning" was incorrectly used instead of "education and teaching".

Table 2 Translation of ST 2

Source text 1	Target text 1	Researcher's faithful translation
نحن أبناء وادي الرافدين، موطن الرسل والأنبياء... ومكتوين بلظى شجن المقابر الجماعية وتجفيف... منابعها الفكرية ... (ibid)	We, the people of Mesopotamia, the homeland of apostles and prophets... and burnt by the flames of grief of the mass graves... and drying out of its cultural and intellectual wells (ibid)	We, the people of Mesopotamia, the homeland of messengers and prophets … and burnt by the flames of the mass graves … and drying out of its intellectual wells

Table 3 Translation of ST 3

Source text 1	Target text 1	Researcher's faithful translation
يحرم اللجوء إلى وسائل تفضي إلى إفناء الينبوع البشري.	It is forbidden to resort to such means as may result in the genocidal annihilation of mankind. (ibid)	It is forbidden to resort to means that result in the annihilation of mankind

The author of the book, which specifically addresses legal translation, seems to have disregarded the crucial aspect of accuracy in her proposed translations. This oversight becomes evident when examining Table 4, which displays the original source text, the target text, and the researchertables faithful translation, allowing for a comprehensive comparison.

In the fifth target text, illustrated in Table 5, three errors are evident in the translation provided by the author of the book. Firstly, there is a mistranslation of the Arabic phrase "العقيد معمر القذافي الأخ" The author failed to faithfully translate the word order of the source text, which is crucial. The accurate translation of this phrase is "Brother and Colonel Muammar al-Qadhafi" rather than "Brother and leader, Colonel Muʿammar al-Qadhafy."

Secondly, there is a misunderstanding of the noun to which the Arabic adjective "العظيم "refers. The author incorrectly assumed that the adjective describes "(ثورة" revolution), whereas it actually describes "(قائد" leader). If the adjective were describing, "ثورة" it should have been" "العظيمة" instead of "العظيم."

Lastly, there is a significant mistranslation of the well-known revolution in modern Libyan history, known as "ثورة الفاتح" (The September Revolution or Al-Fatih Revolution). Unfortunately, the author translated this culturally specific phrase literally, which distorted its cultural significance.

Table 4 Translation of ST 4

Source text 1	Target text 1	Researcher's faithful translation
أغتنم هذه المناسبة لأعبر لكم عن تمنيات بالمخلصة بالنجاح والتوفيق في المهمة الجسيمة والصعبة التي أناطكم بها زملاؤكم الوزراء ورؤساء الوفود . وما تقليدكم المسؤولية إ لا عربون تقدير لخصالكم كرجل دولة محنك ودليل ثقة في كفاءاتكم كشخص ذي باع طويل في حقول التربية والتعليم .	I seize this opportunity to wish you every success in accomplishing the challenging and difficult task which has been entrusted to you by your colleague ministers and the heads of delegations. It is nothing but an appreciation of your qualities as a wise statesman and confidence in your skills and long experience in the field of teaching and learning (Author's translation) (ibid)	I seize this opportunity to express my sincere wishes for your success and luck in the great and hard task which your fellow ministers and heads of delegations have entrusted you with. Giving you this responsibility is but a token of appreciation of your qualities as a resourceful statesman and proof of confidence in your competence as a person with long experience in the fields of education and teaching

Table 5 The table presents the fifth source text, the target text, and the researcher's faithful translation for comparison

Source text 1	Target text 1	Researcher's faithful translation
الأخ العقيد معمر القذافي قائد ثورة الفاتح العظيم وملك ملوك أفريقيا . (ibid, p. 37)	Brother and leader, Colonel Muʿammar al-Qadhafy, guide of the great victorious revolution and king of kings of Africa. (Author's translation) (ibid)	Brother and Colonel Muʿammar al-Qadhafy, great leader of the September Revolution/ Al-Fatih Revolution and king of African kings

The sixth legal text's target text, outlined in Table 6, contains two glaring errors that should not have escaped the attention of the author of the book. The first error is the mistranslation of the Arabic word "سكرتير" which is an example of loan translation, originally derived from Latin through either English or French. Regrettably, the translator provided an incorrect equivalent, "Assistant," whereas the accurate translation for "سكرتير" in English is "secretary."

The second error involves the splitting of the noun phrase (الوزارة the Ministry) and the placement of the noun (مقرّ فرm وعها headquarters of its branches) at the end of the sentence. In this case, the correct translation of the phrase أحد أوِ الوزارة مقرّ فر وعهاis "in the headquarters of the Ministry or its branches" and not "in the headquarters or the branches of the Ministry."

The target text of the seventh source text, created by the author of the book, contains three translation errors. Firstly, there's an issue with the use of "shall" in legal contracts instead of the simple present tense. Although the author mentioned this rule in her book, she overlooked it when providing her own translation of a legal text. The Arabic expression.

"هذا العقد" should have been translated into English as "This contract shall be revoked" instead.

of "This contract is revoked."

The second mistake lies in the mistranslation of the Arabic word "تلقائيا" which simply means "automatically" in English. However, the author translated it into English as "absolutely," which is equivalent to "بدون تنبيه أو إنذار" In Arabic, rather than "بدون تلقائيا" as it should have been.

Table 6 The table below provides the sixth source text, the target text, and the researcher's faithful translation for comparison

Source text 1	Target text 1	Researcher's faithful translation
يباشر المتعاقد واجبات وظيفة سكرتير لِغاتِ أجنبية في مقر الوزارة أو فروعها .	The contracted party shall carry out the duties of foreign languages assistant in the headquarters or the branches of the Ministry. (ibid)	The contracted party shall carry out the duties of the Foreign Languages secretary in the headquarters of the ministry or its branches

The third error is the mistranslation of the Arabic phrase "مطلقا" as "without any prior notice." The faithful translation of this short and simple phrase in English should be "without any notice or warning." It's important to note that the author's translation "without any prior notice" is equivalent to the Arabic phrase "بدون أي سابق تنبيه" (Table 7).

Regarding the target text of the eighth legal document, which was also produced by the author of the book, a careful examination in terms of faithful translation revealed significant errors. Firstly, there's a mistranslation of the Arabic word "فقه" which has a common legal equivalent in English, "jurisprudence." However, the author translated it as "law," which is equivalent to "القانون" in Arabic.

Another issue is the rendition of the Arabic phrase ""نوع الجريمة المرتكبة والمعاقب عليها"" into English as "the type of crime committed and which is therefore punishable." The English translation provided by the author adds a relative clause that isn't present in the source phrase. In fact, the Arabic equivalents "المرتكبة" and "المعاقب عليها" act as adjectives for the noun "جريمة" in Arabic, and their English equivalents "committed" and "punishable" also act as adjectives for the noun "crime." It's unclear why the author didn't provide these equivalents, which could have maintained a lexical balance in the target text.

Furthermore, there's an omission followed by a punctuation error in a short sentence. The Arabic sentence إذا ارتكبت الجريمة يعاقب عليها القانونwas translated into English as "If the crime is to be punished by death or hard labor or imprisonment, it is a felony." The correct legal expression in English for يعاقب عليها القانونis "is punishable by law," not "is punished by law" as suggested by the author. Additionally, there's a repetition of the conjunction "or" twice, which is incorrect in English. Instead, a comma should be used to join the first and second noun, and the conjunction "or" should be used to join the second noun with the third noun.

These mistakes give the impression that the translator lacks experience. Table 8 provides the eighth source text, the target text translated by the author of the book, and the researcher's faithful translation for comparison.

Regarding the target text of the ninth legal document, which was also produced by the author of the book, a close examination with reference to faithful translation revealed serious errors. Firstly, there's an error in the translation of the Arabic expression "راغبو الهجرة الدائمة"which was rendered by the author as "wishing permanent emigration." A more accurate translation based on faithful translation would be "wishing to emigrate permanently," which adheres to English grammar rules regarding what follows the verb "wish."

Table 7 The table below presents the seventh source text, the target text translated by the author of the book, and the researcher's faithful translation for comparison

Source text 1	Target text 1	Researcher's faithful translation
يفسخ هذا العقد فورا وتلقائيا وبدون تنبيه أو إنذار في حال	This contract is revoked immediately and absolutely without any prior notice if (Author's translation) (ibid)	This contract shall be revoked immediately and automatically without any notice or warning if …

Table 8 Translation of ST

Source text 1	Target text 1	Researcher's faithful translation
والقاعدة المقررة في الفقه الجنائي أن العقوبة التي ينص عليها المشرع هي التي تحدد نوع الجريمة المرتكبة والمعاقب عليها فإذا كانت الجريمة يعاقب عليها القانون بالإعدام أو الأشغال الشاقة أو السجن فهي جناية وإن كان معاقبا عليها بالحبس الذي لايزيد أقصى مدته عن أسبوع أو بالغرامة التي لا يزيد أقصى مقدارها عن جنيه مصري فهي جنحة .	The rule established in criminal law is that the punishment which is prescribed by the legislator determines the type of crime committed and which is therefore punishable. If the crime is to be punished by death or hard labour or imprisonment, it is a felony. If the crime is to be punished by imprisonment the maximum duration of which does not exceed a week or a fine the maximum amount of which does not exceed one Egyptian pound, it is a misdemeanour. (Author's translation) (ibid)	The rule established in criminal jurisprudence is that the punishment prescribed by the legislator determines the kind of crime committed and punishable. If the crime is punishable by law by death, hard labor or prison, it is a felony, but if it is punishable by imprisonment whose maximum period does not exceed one week or by a fine whose maximum amount does not exceed one Egyptian pound, it is a misdemeanor

Another error lies in the use of the wrong tense in the translation of the verb "يقيّد." The author used the simple present "are to be recorded," whereas the correct tense in legal texts should be the simple future with the use of "shall" as in "shall be enrolled." Additionally, the Arabic verb يقيّدwhich means "enroll" in this context, was mistranslated into English as "record" by the author. The phrase) ""وزارة الهجرة"" the Ministry of Emigration) was omitted by the author, despite its importance in this legal context. A faithful translation would include this as "the Ministry of Emigration Affairs."

Another error related to punctuation is the unnecessary use of parenthetical commas with the phrase "at their request." Additionally, there's an error in the translation of the verb.

"توزّع" into English as "are to be distributed" instead of "shall be distributed" as per faithful translation. The preposition following the verb "distribute" should be "to" or "among," not "on" as used by the author. Furthermore, the Arabic phrase "والاحتياجات المطلوبة إمكانياتهم" " was mistranslated into English as "abilities" instead of "capabilities." Lastly, the Arabic phrase "الاحتياجات المطلوبة" was mistranslated into English as "the requirements" instead of "the needs required" based on faithful translation. Table 9 provides the ninth source text, the target text translated by the author of the book, and the researcher's faithful translation for comparison.

The English translation of the tenth and final legal text, also produced by the author of the book, exhibited significant issues. A thorough examination of the target text with reference to faithful translation uncovered serious errors.

Firstly, there's a mistranslation of the Arabic phrase "المبادلات التجارية" into English as "trade exchange," whereas a faithful translation would render it as "commercial exchanges." The author used a singular noun for the Arabic plural noun. "المبادلات".

Table 9 Translation of ST

Source text 1	Target text 1	Researcher's faithful translation
مع عِدم الإخلال بحِق المِصريين في الهِجرة يقيدِ راغبو الِهجرة الدائمة بِناء عِلى طِلبهم فِي سِجل بالوزارة المختصة بِشئون الِهجرة، وتوزع فرص الِهجرة التي قِد تتوافر لِدى الِوزارة المذكورة عِلى المقيدين بهذا الِسجل على أساس تخصصاتهم وإمكانياتهم والحتياجات المطلوبة في دول المهجر مع الالتزام بأسبقية القيد فِي السجل .	Without prejudice to the right of the Egyptians to emigration, names of those wishing permanent emigration are to be recorded, at their request, with the Ministry of Emigration. With a commitment to the primacy enrolment in a register, emigration opportunities that may be available to the said Ministry are to be distributed on those enrolled in the register on the basis of their specialization and their abilities and the requirements of the countries they will emigrate to (Author's translation) (ibid)	Without prejudice to the right of the Egyptians to emigration, names of those wishing to emigrate permanently shall be enrolled at their request at the registry of the Ministry of Emigration Affairs. Emigration opportunities which may be available to the said ministry shall be distributed to those enrolled at the registry based on their specializations, capabilities and the needs required in the countries to which they shall emigrate with a commitment to the primacy enrolment in the registry

Secondly, regarding the translation of the phrase, "لكل من رعايا الدولتين" the author chose "the nationals of each state," which could imply the existence of more than two countries. Instead, "both countries" would have been clearer. Additionally, using "state" for "country" might introduce lexical ambiguity in a legal context.

Furthermore, there's a mistranslation of the Arabic phrase "كل موافقة" into English as "all facilities," while the correct equivalent is "facilitation." The author also incorrectly chose.

"Subject to" for the Arabic word," موافق"which should be "in line with" based on faithful translation.

Lastly, there's an unnecessary comma before "subject to." Table 10 provides the tenth source text, the target text translated by the author, and the researcher's faithful translation for comparison.

5 Conclusion

This study has conducted a contrastive analysis of ten Arabic legal texts and their English translations, sourced from El-Farahaty's Arabic–English–Arabic Legal Translation. The researcher meticulously evaluated the translations for accuracy and errors using method of faithful translation. The analysis revealed significant errors in the translations, which impacted both the meaning conveyed in the target language and the overall quality of the translation. These errors included overtranslation, omission of crucial words, incorrect word choices or equivalents,

Table 10 Translation of ST

Source text 1	Target text 1	Researcher's faithful translation
يتعهد الطرفان المتعاقدان بتسهيل المبادلات التجارية بين الدولتين، ووفقا لهذا التعهد يكون لكل من رعايا الدولتين في بلاد الدولة الأخرى بعد الحصول على الإذن منها الدخول والإقامة طبق نظمها .... ويتعهد الطرفان المتعاقدان أن يساعدا بتطبيق كل تسهيل موافق للنظم المحلية في معاملات رعايا الدولتين في التجارة فيما يختص بالضرائب والرسوم الجمركية. (El-Farahaty, 2015, p. 46)	The two Contracting Parties undertake to facilitate trade exchange between the two countries. According to this pledge, the nationals of each state reside in the territory of the other state after obtaining the permission of entry and residence according to its regulations ... The two Contracting Parties pledge to help implement all facilities, subject to their local systems, in the treatment of the nationals of the two countries in trade, with regards to taxes and customs duties (Author's translation) (ibid)	The two Contracting Parties pledge to facilitate commercial exchanges between both countries. According to this pledge, the nationals of both countries in the other country, after having got permission, shall enter and reside in it as per its rules and regulations … The two Contracting Parties pledge to help implement all kinds of facilitation in line with the local rules and regulations in the dealing of the nationals of both countries in trade with regard to taxation and customs duties

gloss translation, misinterpretation of the source text, literal translation, punctuation mistakes, and grammatical errors. These issues suggest that the author did not thoroughly review the translations or consult experts in Arabic-English legal translation who could have identified and corrected these errors. Alternatively, it indicates that the author may lack practical translation experience.

Based on these findings, the researcher recommends further research into the assessment of Arabic-English legal translations. This would encourage professional legal translators and scholars to approach legal translation with greater professionalism and responsibility. Future research could involve quantitative or qualitative studies to highlight the importance of accurate legal translation.

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Legal Regulations for Registering Foreign Technology Companies and Their Impact on the Investment Environment



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Abstract This chapter will discuss the legal rules concerning the registration of foreign technology firms within commercial company regulations. It intends to spell out the difficulties facing foreign technology companies willing to carry on commercial activities that include obtaining work authorization from a competent authority and then registering in the foreigners' registry as companies. The paper also intends to create more insight into the legal steps required and attendant risks of such non-compliance, also offering recommendations resulting from text analysis relative to practice-related laws in Arab countries, in a contribution aimed at enhancing foreign investment through regulatory and legislative measures that would ensure an environment of proper legal light for business. The findings stress respect for these regulations in terms of protecting citizens' rights when dealing with acts of foreign technology companies, promoting real competition likely to inject growth into the domestic economy.

Keywords Foreign technology companies · Commercial laws · Work authorization · Foreign companies register · Foreign investment · Regulatory environment · Commercial legislation · Protection of dealings · Fair competition · Legal procedures

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1 Introduction

Any foreign company wishing to conduct business and commercial affairs must comply with the conditions set by the Jordanian legislature and comply with the relevant legal requirements set out in articles (240/b-242) of the Jordanian Commercial Companies Law No. (22) of 1997, which requires foreign companies to obtain a work authorization from the competent authorities and register in the register of foreign companies operating in Jordan.

This study focuses on the regulations governing the registration of foreign companies in Jordan and aims to gain detailed insight into the legal procedures that must be followed in each case, as well as to highlight the risks of non-compliance with these regulations. The study examines the legal provisions contained in the Jordanian Commercial Companies Law while conducting a comparative analysis with other countries such as Egypt in terms of the legal practices adopted in these countries. The study also presents practical recommendations aimed at improving the legal and regulatory environment offered to foreign companies in Jordan in order to attract foreign investment.

1.1 Study Objectives

This study seeks to achieve the following objectives:

1. Analyze the legal distinction between foreign companies operating in Jordan and domestic companies in terms of the laws and regulations governing their activities and understand the impact of this distinction on the business environment.
2. Evaluate registration procedures imposed on foreign companies operating in Jordan and assessment of their effectiveness and efficiency in achieving the objectives of supervision, supervision and protection of the national economy.
3. Explore the role of relevant authorities in licensing and registering foreign companies, identifying challenges and opportunities in coordinating the activities of these authorities.
4. Identify penalties imposed on foreign companies operating without the necessary registration or authorization and assess the adequacy of these penalties in terms of ensuring deterrence and compliance.
5. Provide recommendations on improving the legal and regulatory framework for foreign companies operating in Jordan, with the aim of improving the investment environment and protecting the interests of the domestic economy.
6. Assess the impact of the presence of foreign companies on competition in the local market, protecting domestic companies and examining how to reconcile attracting foreign investment with protecting the local economy.

1.2 Study Methodology

To conduct this study, a descriptive-analytical approach was employed, gathering information from a variety of legal and academic sources. These sources included Jordanian laws and regulations pertaining to the registration and operation of foreign companies, as well as previous studies and academic references. The analysis involved an examination of legal texts and relevant materials to assess the procedures and obstacles associated with registering foreign companies. In order to provide insights and suggestions for improving the legal and regulatory framework in Jordan, a comparative methodology was employed, drawing on international experiences, particularly the Egyptian experience. It is important to note that qualitative data was obtained through the analysis of judicial decisions and relevant legislation, utilizing analytical tools to generate practical recommendations aimed at enhancing the business environment in Jordan.

2 Legal Requirements for Registering Foreign Companies

To ensure a comprehensive understanding of the financial and economic aspects of foreign companies, the host country has established a set of procedures that must be followed before these companies can commence their operations within its territory. The Jordanian legislator, under the Jordanian Companies Law No. "22" of 1997, has outlined specific requirements for these companies. Firstly, they must obtain a work authorization as stated in Article "240/b" of the law. Once the work authorization is obtained, the companies are then required to complete the registration procedures in the foreign companies' register in Jordan, as outlined in Articles "241, 242" of the same law. These procedures are crucial in granting legal personality to the foreign company. Therefore, this section will be divided into two parts: the first part will focus on the procedures for obtaining a work authorization, while the second part will delve into the registration procedures in the register of foreign companies operating in the Kingdom.

2.1 Procedures for Obtaining a Work Authorization

Article (240/b) of the Jordanian Companies Law No. "22" of 1997 mandates that any foreign company or entity must undergo registration in accordance with the provisions of this law and obtain a work authorization in order to engage in commercial activities within Jordan. The specific authority responsible for issuing the permit will depend on the nature of the company's operations. For example, if a foreign bank intends to establish a branch in Jordan, the Central Bank of Jordan will be responsible

for granting the necessary permit, as stated in Article 6 of the Banking Law No. (28) of (2000) [1].

In accordance with Article (9) of the Jordanian Tourism Law No. (20) of 1988, the permit to invest in tourism in Jordan may be granted by either the Ministry of Industry and Trade, the Ministry of Labor, or the Ministry of Tourism [2].

It is important to mention that Article (40/c) of the Jordanian Investment Environment Law No. (21) of 2022 [3] has been established to promote investment in Jordan and streamline the licensing process. This article states that the time required to obtain a license should not exceed (15) working days, starting from the fulfillment of all legal requirements for granting the license.

While the legislator mandates that foreign companies must acquire an authorization from the appropriate authority prior to commencing the registration process, there are additional authorities that stipulate that these companies must be registered in the foreign companies register before obtaining the permit. An illustrative instance of this is the Electricity Sector Regulatory Commission, which necessitates the registration of any foreign company desiring to invest in electricity generation, transmission, or distribution. This requirement can be deduced from the wording of Article (4/a) of the Jordanian Electricity Companies Licensing System [4], No. 76 of 2001 [5].

The Jordanian judiciary, in alignment with the Jordanian legislator, has underscored the importance of foreign companies acquiring the appropriate authorizations from the relevant authorities prior to initiating operations in Jordan. A judgment rendered by the Jordanian Court of Cassation explicitly articulates this stance by stating that in light of this, the Jordanian Companies Law mandates that foreign companies seeking to conduct business in Jordan must, in compliance with the stipulations of Article (240/b) of said law, obtain all requisite permits from the pertinent authorities [6].

3 Registration in the Foreign Companies Register

The objective of the Jordanian legislator in mandating that foreign companies register in the foreign companies register is to safeguard the interests of third parties engaging with the company. This requirement ensures that these parties have comprehensive knowledge of the company's legal and financial structure, including its capital size, activities, partner nationalities, and more. Additionally, this registration empowers the host country to gain a complete understanding of all aspects pertaining to the foreign company, enabling effective oversight and authority over all foreign companies operating within its jurisdiction. Furthermore, it serves to shield domestic companies from any potential repercussions arising from the operations of these foreign entities, fostering a climate of equitable competition that ultimately stimulates investment in Jordan.

In the Jordanian Companies Law [7], the legislator provides guidance on the registration process for foreign companies and the necessary documentation. Articles

(241–242) outline the specific requirements. According to paragraph (a) of Article (241), the registration application must be submitted to the Registrar, along with the relevant documents and information translated into Arabic. For non-Arab foreign companies, the translation must be certified by a notary public. The documents required, as stated in Article (241/a), are:

1. A copy of the company's statute and regulations or other document on the basis of which it was established, as well as a statement on the method of its establishment.
2. Official written documents confirming that he has obtained the consent of the competent authorities of Jordan to operate and invest foreign capital in accordance with applicable legislation.
3. A list of the members of the management board, managing directors or partners, as applicable, including the nationality of each member and the names of the persons authorized to sign documents on behalf of the company.
4. A copy of a power of attorney authorizing a resident of Jordan to manage the company's affairs and receive notices on its behalf.
5. Financial statements for the last financial year of the company at the headquarters, certified by an authorized auditor.
6. Any other data or information deemed necessary by the Registrar.

According to paragraph (b) of the aforementioned article, the person authorized to register the company must sign the registration application in the presence of the Companies Registrar or their authorized representative, or alternatively, in the presence of a notary public. The application must include the following information:

- The company's name, type, and capital.
- The company's objectives in Jordan.
- Detailed information about the founders or partners, the board of directors, and the share of each.
- Any additional data or information deemed necessary by the Registrar.

Once the application, along with all necessary documentation and information, is submitted to the Companies Registrar, the Registrar is granted discretionary power by Paragraph (a) of Article (242) to either accept or decline the company's registration. If the registration is accepted, the company will then proceed with the necessary legal procedures in order to be officially registered in the companies register. Following the payment of the required legal fees, the company's registration will be announced in the official gazette. Subsequently, the Registrar will inform the company of its successful registration and the commencement of its activities.

According to Article (5/a) of the Foreign Companies Registration Law No. (58) of (1985) [8], the Companies Registrar is required to provide a verdict of acceptance or rejection within one week from the submission date of the application.

In the event that any modifications arise pertaining to the company's particulars, the company is bound by Paragraph (b) of Article (242) of the Jordanian Companies Law No. "22" of 1997 to file an application with the Registrar within thirty days of said modifications. This application must provide a comprehensive account of

the changes and must adhere to the procedures outlined in Paragraph (a) of the aforementioned article.

According to paragraph (c) of the same article, the foreign company's branch operating in Jordan must include certain details in its official documents and correspondence. These details include the name, citizenship, legal form, address, and capital of the foreign company in both its home country and Jordan, as well as the registration number of its branch with the Registrar. The researcher suggests that the Companies Registrar has discretionary power to reject the registration of a foreign company, but is not obligated to provide reasons for the refusal. However, upon conducting research and examining the Companies Control Department at the Jordanian Ministry of Industry and Trade, no instances were found where the Registrar refused registration to a foreign company that met the legal requirements.

The researcher strongly believes that it is an unjust exercise of power for the law to empower the Companies Registrar with the ability to reject the registration of foreign companies that have fulfilled all legal requirements. This abuse of power has the potential to detrimentally impact the national economy. These foreign companies contribute significantly to the host countries' economies, which entice them with various exemptions, privileges, and incentives. Additionally, such a refusal would directly contradict the provisions outlined in the Jordanian Investment Environment Law No. (21) of 2022. According to Article (40/d) of this law, the competent authorities are required to provide justifications for any decision to deny licenses to these companies within the specified timeframe.

The Companies Registrar in Jordan has been granted the authority to reject the registration of a company if its articles of incorporation are in violation of the constitution, public order, or current laws and regulations. This decision was confirmed by the Jordanian High Court of Justice, which stated that Article (59/a) of the Jordanian Companies Law No. (22) of (1997) and its amendments clearly outlines the powers of the Companies Registrar in relation to company registration. According to the court, the Registrar is empowered to approve the registration of a company if its articles and bylaws comply with the law, but also has the right to refuse the application if the articles and bylaws are in violation of the law, regulations, or any other applicable legislation. Upon receiving a letter from the Companies Registrar denying the application for company registration due to the absence of approval from the Central Bank and the Securities Commission, it became evident that the Registrar's decision strayed from the legal requirements outlined in the Companies Law and its accompanying regulations. The Registrar imposed additional conditions for acceptance that were not stipulated by the law. However, the objection lodged by the applicants against this unlawful decision was ultimately dismissed. Therefore, it is imperative to declare the decision null and void. Consequently, based on the aforementioned reasons, we hereby decree the annulment of the contested decision [9].

Is it possible to contest the Companies Registrar's refusal to register a foreign operating company, or is the decision irrevocable? The decision made by the Companies Registrar can be appealed to the Minister of Industry and Trade through legal channels, even if the foreign company has followed all the necessary registration

procedures outlined in Articles (241–242) of the Jordanian Companies Law No. (22) of (1997). In the event that the Minister of Industry and Trade upholds the decision of the Companies Registrar, the foreign company has the option to challenge the Minister's decision in the Administrative Court, as stated in Article [5/a/9] of the Administrative Judiciary Law No. (27) of (2014). This article grants the Administrative Court exclusive authority to hear appeals against final administrative decisions, including those falling within the jurisdiction of the Administrative Court under any other law [10].

It is worth mentioning that in Chapter Twelve of the Jordanian Companies Law No. 22 of 1997, the legislator did not impose any sanctions on foreign operating companies for engaging in business activities without obtaining a license or fulfilling the registration requirements outlined in the same law. As a result, it becomes necessary to establish a suitable penalty for this offense in Chapter Fifteen of the aforementioned law, which specifically addresses penalties. In this case, Article (282) [11] is applicable to address this violation [12].

According to the researcher, while this particular article serves as the sole lawful recourse for addressing transgressions committed by foreign operating companies, the prescribed penalty fails to adequately reflect the gravity of the violation. It is the researcher's contention that the legislator ought to have incorporated a more rigorous penalty within the initial segment of Chapter Twelve specifically targeting foreign operating companies in the event of any breach of the law's provisions.

According to Article (43) of the Jordanian Bar Association Law No. (11) of (1972) [13], it is mandatory for the articles of any company to be signed by a practicing senior lawyer during the registration process. This requirement extends to foreign operating companies as well, as their articles must be endorsed by a practicing senior lawyer to ensure the legality of their registration and enable them to initiate their operations [14].

Similar to the approach taken by the Jordanian legislator, the Egyptian legislator has implemented a requirement for foreign companies operating within Egypt to undergo registration in the commercial register. As stated in Article 166 of the Egyptian Companies Law No. 159 of 1981, foreign companies are obligated to register in the commercial register and inform the designated authorities mentioned in the executive regulations, while providing the necessary documentation. Additionally, it is mandatory for the company to appoint an auditor in accordance with the conditions outlined in the executive regulations (Companies Authority). The executive regulations of the law stipulate that foreign companies must refrain from conducting any activities until they establish and register a branch in a designated register specifically created for this purpose. Failure to register will result in the administrative closure of the company's branch, as stated in Article 309 of the executive regulations of the Companies Law [15, 16].

In Egypt, the General Authority for Companies and Partnership (hereinafter known as General Authority for Companies) oversees a dedicated registry for foreign company branches, which contains comprehensive information about the company. This includes details such as the parent company's name, objectives, activities, and

primary office location (as stated in Article 310 of the executive regulations). Furthermore, the regulations specify that auditors appointed must meet the same requirements as auditors of the shareholding company (as outlined in Article 311 of the executive regulations).

The eligibility criteria for individuals appointed as branch managers of foreign companies operating in Egypt are outlined in Article 167 of the same law. These criteria include a requirement that the appointed individuals have no prior convictions for criminal or misdemeanor offenses related to theft, fraud, breach of trust, bankruptcy, or forgery. It is essential for branch managers to possess integrity, as those lacking this quality are not eligible for appointment [17].

As per Article 314 of the executive regulations of the Companies Law, branches of foreign companies operating in Egypt must disclose all relevant information and data about the foreign company, including its registration number in the commercial register, at their respective offices [18, 19].

The Egyptian legislator has given the commercial register office the authority to review and authenticate the information provided by applicants. To ensure the application is accurate and meets the necessary requirements, the office has the discretion to request additional documents and information. If the application fails to meet the legal conditions, it will be rejected by the register office, and the reasons for the rejection must be justified [11, 20]. Within two months of submission, the applicant will be informed of the rejection decision [21]. If desired, the applicant can appeal the register office's decision to the Administrative Judiciary Court, following the procedures outlined in Article 15 of the Administrative Judiciary Law No. 27 of 2014. It is important to note that the commercial register office has the choice to request or not request additional data to verify the accuracy of the application [22, 23].

The decision made by the legislators in Jordan and Egypt to establish a dedicated register for foreign companies is highly praised by the researcher. This measure aims to ensure the protection of the rights of individuals engaging with these companies, safeguard the interests of national companies, and establish a system of supervision over the capital, funding sources, and employment practices of foreign companies. By implementing this requirement, the state asserts its sovereignty over all individuals and entities operating within its jurisdiction [24].

According to the researcher, the approach taken by the Egyptian legislator in regards to registration procedures for foreign companies is more precise and transparent compared to that of the Jordanian legislator. In Egypt, the law clearly states the consequences of operating without registration, which includes the closure of the branch. It also mandates that every company operating in Egypt must establish a branch, sets conditions for appointing a branch manager, requires each branch to have an auditor based on specified criteria, and explicitly states that any rejection of registration must be justified. However, the Jordanian legislator does not provide for any penalties for a foreign company that has not applied for a permit, does not impose an obligation to establish a branch and does not provide for the conditions for appointing a branch manager, which in the case of British law usually include

morality and good conduct. Furthermore, Jordanian law authorizes the Registrar of Companies not to provide reasons for refusing registration.

4 Conclusion

In summary, this study shows that legal procedures for foreign corporations at the national level contribute significantly to creating a fair and open business environment. These regulations help protect the local economy and create competition in the market, which in turn increases the attractiveness of foreign investment and ensures sustainable development. Additionally, the need to register and obtain the required permits enables tracking of the country's foreign economic activities and ensures compliance with local laws and regulations. Therefore, it is important that legislators continue to evaluate and improve these statutes to meet economic changes and create incentives to invest in a friendly and safe business environment.

4.1 Results

The study reached the following results:

1. There is a clear legal distinction between foreign operating companies and domestic companies in terms of the laws and regulations governing their activities, which increases confidence among those dealing with these companies.
2. Imposing an obligation on foreign companies to register in the register of foreign companies strengthens the state's ability to supervise and supervise these companies, contributing to the protection of the national economy and ensuring fair competition.
3. The authorities responsible for issuing authorizations to foreign companies vary depending on the type of business activity, requiring effective coordination between various government authorities to streamline procedures.
4. There are no appropriate penalties for foreign companies operating without registration and the necessary authorizations, which may pose a challenge to effective law enforcement.
5. Registration procedures require the submission of a variety of documents and information, and these procedures should be clear and specific to ensure compliance of foreign companies.

4.2 Recommendations

Based on the findings of this study, the following recommendations are made:

1. Increasing transparency and legal procedures related to the registration of foreign companies and providing clear and up-to-date information on legal requirements and necessary procedures.
2. Develop and update penalties for foreign companies operating without registration or authorization to make them dissuasive and effective.
3. Unify the authorities responsible for issuing authorizations and registrations, or at least improve coordination between them, to make procedures easier and faster for foreign companies.
4. Strengthen the role of regulatory and supervisory authorities to ensure compliance of foreign companies with applicable laws and regulations, thereby increasing the stability of the investment environment.
5. Prepare a comprehensive guide for foreign companies on registration procedures, permits and legal obligations and make it available in multiple languages to ensure that the information reaches all foreign investors.
6. Strengthening cooperation with other countries to exchange experiences and best practices in regulating the activities of foreign companies and benefiting from successful experiences in this area.
7. Improving the investment environment by offering incentives and facilities for foreign companies, while maintaining a balance that protects domestic companies and promotes fair competition.

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The Legal Dimensions of the Author's Electronic Copyright in the Era of Digital Transformation: Between Criminal Protection and Prevention



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Abstract This research evaluates the effectiveness of criminal safeguards for authors' online copyright by examining the laws of various Arab and foreign nations. It concentrates on the manner in which these regulations tackle digital infringements and breaches of intellectual property rights, alongside the accountability of internet service providers for cybercrimes occurring on their platforms. Findings indicate that numerous legislations provide robust protection through harsh penalties, while the laws of certain countries enhance the fight against cybercrimes by regulating the responsibility of internet service providers, contingent upon proving actual knowledge of the infringement. The study advocates for the fortification of criminal laws to encompass all types of digital abuse, the standardization of accountability criteria on an international scale, and the enhancement of mechanisms for reporting illegal content to guarantee justice and effective copyright protection.

Keywords Copyright · Digital age · Criminal protection · Civil protection · Electronic legislation

1 Introduction

Copyrights serve as essential components in safeguarding artistic and literary creativity, highlighting the pressing need for legal protection of these rights. This discussion seeks to examine the avenues of criminal protection that secure the rights holder (author) against infringements impacting their works, whether through direct acts like counterfeiting or through digital breaches that may arise online. Within

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this framework, the significance of establishing robust protection systems that incorporate criminal penalties to discourage violators and offer restitution to impacted authors is clearly underscored.

The system of intellectual property protection fundamentally includes criminal safeguards for copyright, designed to elevate the rights of authors and protect them against various infringements, including the unauthorized reproduction of their works or illicit usage. This study aims to assess the efficacy of copyright laws in addressing related crimes by examining different legal frameworks, including those in Algeria, Jordan, France, and the United States. Additionally, it seeks to provide recommendations that can enhance criminal protection systems, ensuring both justice and effective safeguarding of creative endeavors.

1.1 Study Methodology

The research employs a comparative analytical approach, concentrating on the examination of significant legal texts from Jordan, Algeria, France, and the United States. Data collection occurs through an evaluation of relevant legislation, judicial decisions, and legal rulings, alongside consultations with academic resources and legal experts.

2 Basis of Civil Liability for Internet Intermediaries and Compensation

The bases of civil liability are varied. Typically, liability can be contractual, stemming from a breach, delay, or non-fulfilment of a contract, or it can be tortious in instances where the injured party incurs damages without any existing agreement with the wrongdoer. A key tenet of civil liability is that contractual and tortious liabilities must remain separate. Legal scholars and the judiciary widely agree that it is impermissible to merge these liabilities, whether through sequential lawsuits or by selecting the most advantageous provisions for the harmed party from both liability types. The underlying purpose of liability is to address the harm caused. Furthermore, opting between the two forms of liability is not permitted; this conclusion is rooted in principles of logic and justice. When a contract exists, the injured party cannot pursue tortious liability. Contractual liability serves as a penalty for violating the contractual relationship between the creditor and debtor, functioning as an extension of the contract and barring the aggrieved party from seeking tortious liability [1–3]. As long as a contract is in place, the creditor is limited to filing a claim for contractual liability. The relationship formed through the contract, which is defined by the mutual interests of the involved parties, guarantees a balanced and fair agreement with binding authority. Consequently, this contract becomes the governing law for

those parties as per legal standards. Thus, honoring this binding authority necessitates compliance with contractual obligations and disallows the option to select between different liabilities [4–7].

For civil liability to be established, whether in a contractual or tort context, the following key elements must exist: the wrongdoing of the offender, the duty to compensate the injured party for the harm suffered, and the causal link between an action and the resulting damage. These elements are as follows:

2.1 Wrongdoing

Error is characterized as a violation of a prior obligation. To accurately define error, it is essential to differentiate between two categories: contractual error and tortious error. Contractual error arises when a party that has an agreement with the author concerning the infringed work commits a violation of the author's rights. Conversely, tortious error represents a breach of a legal responsibility assigned to a separate individual, which may be specific as an obligation or general as a duty to honor the rights and freedoms of others while refraining from causing them harm [8–11].

In the context of copyright, contractual errors arise in the dynamics between the author and those who receive exploitation rights, all of whom are governed by a valid and comprehensive contract—be it for the exploitation of rights, permission for online use, or for website creation. Such errors occur when there is a breach of the contractual duty or a postponement in its execution. Examples include a publisher not publishing the work or delaying its release beyond the typical timeframe, or when transferees meet their obligations under the exploitation agreement in a way that strays from the original terms agreed upon [12–15].

A contractual error occurs when a publisher produces a work inappropriately for the author or disregards the quality of printing stipulated in the publishing agreement. Likewise, if the publisher does not publish the work online as specified by the author—such as altering or omitting elements that were originally included—it represents a breach of contract. Furthermore, transforming a film into a stage production without the author's approval, translating a database into a different language and selling it without the author's consent, or exceeding the agreed-upon number of copies of computer programs for sale to generate extra profit, also constitutes a contractual error [16–19].

Tortious error is characterized as a violation of a right that the perpetrator is conscious of committing. It also encompasses the failure to perform a necessary action or the execution of an action that ought to be avoided. This behavior strays from acceptable norms and is apparent when rights are infringed upon by an individual who does not have a contractual connection with the creator regarding the work. To establish tortious error, two criteria must be satisfied: first, the breach, which refers to the failure to adhere to the general legal duty of not causing harm to others, indicating a departure from the conduct expected of a reasonable person; and second, the awareness, where liability is not determined solely by the fact of a

breach but must also be linked to the actor's consciousness of their actions. A person is held accountable not just for the breach itself but because the act was conducted intentionally. Therefore, in the case of tortious error, the individual responsible for the breach must possess awareness of it, meaning they should be able to differentiate their actions, as there is no liability for those who lack this capacity [20–22].

The unauthorized publication of digital creations like computer programs, along with their modification or alteration, as well as companies replicating software without the author's permission—particularly in cases of high demand—represents a tortious error. Such actions encompass the sale, rental, or offering of these works to achieve significant profits that far exceed what the rightful owners of these programs would earn. Furthermore, acts deemed intellectual piracy by legal scholars, including the theft of scientific research, particularly that which is available online, also qualify as a tortious error [12, 23].

2.2 Tort

As stated in Article (256) of the Jordanian Civil Code, a harmful act is necessary to establish tortious liability. In terms of contractual liability, this is characterized by the debtor's failure to meet their obligations stemming from the contract. An example of this occurs when a party engaged with the author does not complete all or part of their responsibilities or experiences delays in execution, as seen in publishing contracts. If the publisher either declines to publish the work or publishes it without obtaining the author's consent, it represents a violation of the author's economic and moral rights [24–27].

The nature of moral rights, regarded as an extension of the author's personality, is clarified by The Law on the Protection of Copyright, which states that any violation of these rights causes harm that requires compensation if proven [28]. To demonstrate harm resulting from copyright infringement, it must be both certain and actual. Actual harm is defined as immediate. For example, when a third party publishes a work without the author's consent, alters it, or removes it from circulation, the harm is deemed real and immediate rather than speculative. The court has the ability to verify and evaluate this harm, with the additional requirement that the harm must be direct, indicating it is a natural outcome of the infringer's actions. This determination falls under judicial discretion, depending on the specifics of each individual case [29, 30].

Within the framework of the information revolution, which has intensified the challenges faced by authors due to the boundless and global reach of the Internet, unauthorized use enables anyone across the globe to easily access and download their creations, amplifying the potential harm to the creator. For instance, when a publisher re-releases a software program or database for commercial gain without the author's consent, it inevitably results in tangible damage to the author, such as the lack of financial remuneration for the exploitation of their work, alongside moral harm, which includes a violation of their intellectual integrity through the decision to re-publish and distribute the work without authorization.

The notion that violations of an author's moral rights lead solely to moral damages is mistaken. For instance, modifying a work without the author's permission will certainly cause material harm, including decreased sales and a hesitance from the public to interact with the work, alongside moral damage that negatively impacts the author's reputation and lowers their cultural status.

The damage resulting from the violation of an author's moral rights must be established by the author, but it is impractical to depend on the author to evaluate these damages, adhering to the principle that one cannot serve as both a participant and an adjudicator in the same issue. Rather, it is the judge who holds the discretionary power to assess the harm endured by the author.

2.3 Causation

In Jordanian civil law, a crucial aspect of civil liability is the causal link between an action and the resulting damage. It is clear that an individual can only be held accountable for damages that are viewed as a direct consequence of their actions. Thus, a direct causal connection between the act and the damage must be established for civil liability to be invoked under Jordanian civil law. This connection is negated by external factors, such as force majeure, the actions of a third party, or the victim's own fault. Without proving this causal relationship, a claim for liability and compensation cannot be effectively pursued [31].

In legal doctrine, the idea of causation is not open to discussion, as there is agreement on the importance of applying the general principles of civil liability concerning violations of authors' rights. The party that has suffered harm can establish the causal link through a variety of means, including witness testimony, physical evidence, and expert analysis. Nevertheless, establishing causation in the realm of electronics poses difficulties due to the intricate and evolving nature of electronic matters, along with the unclear origins of apparent issues. Factors contributing to harm may arise from remote or concealed elements associated with hardware setups, overlapping information, and roles, complicating the task of pinpointing the effective cause [32].

When the components of civil liability—fault, damage, and causation—are established, the author is entitled to just compensation for the harm inflicted on their financial and moral rights. Practical experience indicates that managing information dissemination on the Internet necessitates the collaborative efforts of individuals with various roles and responsibilities in its functioning. For users to access, navigate, and retrieve or share the information they desire, multiple individuals, typically referred to as "Internet service providers," must oversee the hosting, broadcasting, and presentation of that information. This variety in their functions facilitates the monitoring and identification of illegal informational activities. Nonetheless, achieving this goal depends on the presence of legal frameworks that outline the rights and duties of parties involved in electronic activities, as well as their responsibilities toward one another and the society in which they reside. Therefore, there is an urgent necessity for thorough legislative measures that define the legal status of Internet service providers

and elucidate their accountability for violations that occur within the network. This objective can only be realized through the collective efforts of lawmakers at both national and international levels [33].

The role of intermediaries in a technical capacity is vital for establishing their liability. When these intermediaries are connected to others via subscription or supply agreements, it becomes relatively straightforward to outline their obligations to these third parties since the contract serves as a basis for determining liability. The complexity emerges, however, when it comes to defining their liability regarding informational content—specifically, published works that are accessible illegally—transmitted through their technical systems. This situation highlights the challenges involved in creating an effective liability framework for Internet intermediaries.

In this context, an initial effort was made by the French government on June 14, 2001, through a bill concerning "Information Companies," which aimed to establish the legal status of Internet service providers. This bill, however, was subsequently annulled due to legislative modifications. Following this, a new bill titled "Confidence in the Digital Economy" was presented on January 15, 2003, and it received approval from the French legislature on June 21, 2004. As of that date, Internet service providers in France operate under their own legal framework [33, 34]. In contrast, Jordanian legislation does not contain a specific provision related to this matter within the Temporary Electronic Transactions Law No. 85 of 2001 [35].

The classification of information services and the standing of their providers differ based on the kind of service being provided. Certain services focus solely on the storage of electronic data and the exchange of information via the network, whereas others encompass the collection, organization, and dissemination of information to the general public.

3 Hosting Services

In the realm of electronics, the term "hosting" pertains to the provision of technical and informational resources, which may be offered for a fee or at no cost, enabling customers to access the internet at any time to disseminate specific informational content, such as texts, images, or sounds, to the public. A hosting provider undertakes this responsibility by storing the data and information uploaded by website owners to their servers, which maintain a constant connection to the internet. This connectivity ensures that website owners can make their content accessible to the public around the clock. Article 14 of the European Directive on "E-Commerce" and Article 6–1/2 of the French Law on "Confidence in the Digital Economy" describe this service as an activity conducted by a natural or legal entity, focused on storing websites and web pages on their servers, either for a fee or free of charge. This service provides clients with the technical and informational means to broadcast their desired content on the internet at any time, including texts, images, sounds, organizing conferences and discussion forums, and creating hyperlinks to other sites. Among the resources that hosting providers offer their clients are disk space or bandwidth allocation for

publishing information online, a personal account with an access code for identification, and a specialized program that allows them to connect to the hosting provider for adding, deleting, or modifying information as necessary.

In assessing contractual obligations, it is essential to differentiate between hosting services offered for a fee and those provided at no cost in order to understand the legal nature of the service rendered by the hosting provider. When a website owner compensates for hosting services, they gain access to the technical and informational assets of the service provider while utilizing a designated segment of their hard disk, maintaining a continuous and direct connection to the internet. The agreed-upon fee is determined by the volume of information to be disseminated and the duration of that dissemination. Therefore, paying for hosting services can be compared to renting a segment of the hard disk or a network space from the hosting provider (lessor) to the website owner (lessee). Conversely, free hosting resembles the act of lending a segment of the hard disk or a network space from the hosting provider (lender) to the website owner (borrower).

Legally defining the hosting service as either a rental or a loan, contingent upon whether a fee is imposed, is in accordance with legal regulations. This becomes apparent when a hosting provider designates a particular portion of their hard drive for a website owner. In these instances, the website owner, acting as either a lessee or borrower, is required to utilize the designated space in compliance with the terms outlined in the hosting agreement and relevant legal standards. On the other hand, the hosting provider, serving as either a lessor or lender, is obligated to provide an internet-connected area on their hard drive for the website owner, allowing them to disseminate their intended information through the network as stipulated in the hosting contract. It is important to highlight that hosting information on the internet is distinct from providing it; the latter entails publishing content and making it publicly accessible, which extends beyond the conventional function of the hosting provider, whose role is primarily focused on storage [36].

4 Information Supply Services

The term information supply describes the process of distributing information, ensuring it is available to the public in formats that are readable, visible, or audible. Utilizing web pages and the internet for this purpose is recognized as a form of "public communication means," aimed at granting network users access to particular informational content, including texts, messages, images, sounds, and more [37].

The entity that delivers information to the network is known as the information provider. This individual, who may be a producer, supplier, author, or simply a rights holder, can range from an everyday person to a professional dedicated to the collection and distribution of information for networks. They hold the crucial responsibility of generating and compiling information on a particular subject, establishing themselves as the main accountable party for the information disseminated through the network [8, 38].

The process of supplying information over the network entails uploading data to the central storage devices or rented disk space provided by the hosting service. The entity responsible for this information—referred to as the information provider or content provider—gathers or composes content on a particular subject. As the legitimate owner of the means of public communication, this provider, whether an individual or an organization, possesses the genuine authority to oversee the electronic informational content they create or compile. Consequently, they hold the right to either distribute or withhold information from users on the network. This function mirrors that of traditional content providers, such as editors or publishers in print journalism, news agencies, or audiovisual media, who manage editorial content to ensure the provision of accurate and credible information [39].

The hosting provider is distinct from the information provider in that it does not generate or gather electronic informational content; instead, it simply stores this content on its devices under a contract with the information provider, which allows the public to access it at any time. While the provider functions as the publisher in a publishing service, hosting resembles the act of renting or lending space on the network, with the hosting provider acting as the lessor or lender. Despite these distinctions, both play a role in delivering informational services via the internet. Without their participation, data and information cannot be transmitted across the network, nor can they be made accessible to the public without the essential technical capabilities to link remote communication networks with users' computers [8, 40].

The information provider's contractual obligations are triggered when they breach any stipulations of the supply agreement with the internet access provider or other professional intermediaries within the information services sector, as well as when they violate any terms of the subscription contract with a client. Additionally, if the provider's dissemination of information inflicts harm on others—whether through the publication of false, damaging, or defamatory content—it is deemed tortious, as general principles impose a responsibility to honor the rights of others and prevent harm. Consequently, tortious liability may arise if the broadcasted information infringes on privacy rights, defames an individual's reputation, violates intellectual property laws, incites criminal behavior, or contains false, misleading, or scandalous information. Therefore, any criminal actions undertaken by the information provider that result in material or moral harm to others with whom they maintain a contractual relationship can serve as a basis for tortious liability [41, 42].

When all elements of liability are confirmed, the author is entitled to appropriate compensation. In deciding the amount of compensation, the court takes into account the author's cultural and literary status as well as the degree of benefit gained from the unauthorized use of the work [24]. Compensation for the unauthorized exploitation of protected works encompasses both material and moral damages. Material damages represent the sum that the infringer (imitator) would have compensated the author had they secured written consent for the imitation. Meanwhile, moral damages pertain to the damage inflicted on the author's reputation or their cultural and artistic standing.

The main goal of compensation is to address the harm experienced by the author. When it is feasible to fully eliminate the damage by reinstating the prior condition,

compensation is provided in kind. However, if that is not achievable, the court must turn to monetary compensation or other forms of non-material restitution.

In-Kind Compensation

In the realm of copyright, in-kind compensation pertains to the court's action of eliminating any evidence of infringement on the rights of the author, initiated at the request of the author or their successor. This may entail mandating the halt of publication, display, or printing, as well as the destruction of copies, images, or materials involved in the publication process, or modifying those copies, images, or materials to render them unusable, all at the cost of the party held accountable. Furthermore, compensation could be granted if deemed warranted [43].

In copyright law, the term in-kind compensation refers to the court's measures taken to remove any evidence that infringes upon the author's rights, based on a petition from the author or their successor. This procedure involves mandating the cessation of publication, display, or printing, along with the destruction of copies, images, or materials used in the publication, or altering these copies, images, or materials so that they become unusable, all at the expense of the responsible party. Additionally, compensation may be awarded if deemed appropriate [43].

In-kind compensation can take various forms depending on the nature of the infringement involved. For example, when a statue has been altered through the addition or removal of materials, specific performance would require the responsible party to either restore the statue to its original state as envisioned by its creator or remove the modifications made. In a similar vein, if the infringement concerns a literary work where an individual's name has been added, in-kind compensation would necessitate the removal of that name and the reinstatement of the true author's name. In instances where an author's right to withdraw their work from circulation has been violated, in-kind compensation might involve making the work publicly accessible again. Moreover, if the infringement pertains to the proper attribution of the work to its author, in-kind compensation could demand that the work be republished under the rightful author's name. Additionally, if the infringer has delayed the release of the work to circumvent the author's preferred timing for presentation, compelling the infringer to publish it promptly may also be required, as stated in Article 47 of the Jordanian Copyright Law [29].

Material Compensation

This refers to the approach a judge must take when in-kind compensation cannot adequately address the harm inflicted by a violation of the work. This type of compensation may be monetary or non-monetary in nature. Non-monetary compensation can be suitable when the aggrieved party believes that a financial award would not sufficiently remedy the loss incurred. For instance, rather than demanding the destruction of unauthorized copies, the author might request that the court mandate the return of all or a portion of these copies, based on the literary damage resulting from the infringement, and to subsequently sell them to offset the harm suffered. This aligns with Article 47(c) of the Jordanian Copyright Law.

Monetary compensation is regarded as the most appropriate means of addressing harm stemming from illegal actions and serves as the cornerstone of liability for damaging acts. This is due to the fact that money's role is to rectify the harm, whether it be material or moral. In situations where retrieving circulated copies for destruction is unfeasible, or where alterations cannot be made, or in instances of infringement on the public performance of the work and its material use, the compensation would be determined by the monetary gain realized by the defendant, along with the entitlement to compensation for the harm caused by the unauthorized public exhibition of the work [25].

The Jordanian Civil Code's explanatory memorandum outlines that while in-kind compensation is typically the standard in contractual liability, it is viewed as an exception when attempting to revert a situation to its original state. In matters of tortious liability, monetary compensation, or a financial sum, is established as the general principle, emphasizing that compensation should be monetary.

As outlined in Article 49 of the Jordanian Copyright Law, moral damages incurred by the author are eligible for monetary compensation: "The author whose rights on their work under this law have been infringed has the right to obtain fair compensation for that…" To prioritize public interest over private interests in specific circumstances noted in the Jordanian Copyright Law, particularly in Article 47, the legislator has limited the author's ability to seek monetary compensation in lieu of in-kind compensation. Furthermore, the Jordanian legislator has delineated general guidelines for determining compensation and the criteria applicable for these evaluations in Articles 264 and 268 of the Jordanian Civil Code [26].

5 Criminal Protection of Author's Copyright on the Internet

The legislator extended beyond merely ensuring civil copyright protection, aiming to establish a more stringent and deterrent criminal safeguard against any infringer who commits acts violating the copyright and related rights of performing artists, sound recording producers, audiovisual recording creators, and broadcasting entities. This objective is met by criminalizing such actions, which, despite their diversity, the Algerian legislator sought to classify under a singular offense referred to as "counterfeiting". In contrast, the Jordanian legislator emphasized the necessity of legal protection for copyright from a criminal standpoint, recognizing the efficacy of criminal penalties in deterring violations and the expediency of legal processes. The Jordanian legislator made it a crime to sell, rent, or distribute literary and artistic works without written consent from the copyright holder or the holder of related rights in any form of distribution, regardless of whether the seller or renter was aware of the true nature of these works [33, 27].

In the realm of intellectual property, as in other domains, criminal liability adheres to the principles of criminal legality. To establish an offense, all elements must be

demonstrated according to the legal framework, and responsibility must align with the principle of evidential legality concerning its origin, ensuring that there is no reasonable doubt regarding the evidence used to substantiate the crime. Unlike other criminal allegations, certainty is required for proving all elements rather than relying solely on probabilities. The identification of the perpetrator must be unequivocal, as criminal liability is inherently personal. Furthermore, when it comes to legal entities, it is necessary to prove that either the representative of the entity or someone acting on their behalf committed the offense, encompassing all legally defined material and moral components in accordance with the specified legal model outlined in the text of criminalization.

It has been established by comparative jurisprudence that proving replication or counterfeiting is essential, as these actions represent the physical acts that define the crime by legal standards. Such actions do not fall under legitimate practices like quotation or reverse engineering in software development environments. These matters necessitate both legal and technical knowledge, and their novelty in litigation leads to various defenses and secondary issues where expertise is vital. It is crucial to highlight that the ultimate authority on such matters is the judge, who makes rulings in criminal cases based on their subjective beliefs and insights from the evidence presented. A notable illustration of this is [the appeal case No. 207/2001 decided on February 21, 2001], which showcased an in-depth analysis of the criminal statutes within the Jordanian Copyright Law. The court explicitly determined that the activities deemed criminal in this domain are restricted to financial exploitation actions, such as sale or rental, and only pertain to financial exploitation. Consequently, utilizing a work without any financial exploitation does not constitute a crime under the law. The court arrived at a just and impartial conclusion in a case concerning intellectual property involving a significant financial institution.

The safeguarding of creativity within literary property revolves around finding equilibrium between a creator's desire to shield their work and the temporary chance to benefit from their intellectual contributions, alongside society's demand for knowledge and its dissemination. This equilibrium helps avert the monopolization of a creator's work and allows for compulsory licensing, which serves to uphold culture and address societal growth requirements. Although every creator possesses the right to defend their creation, it is equally our responsibility as a society to ensure that such protection does not hinder progress or upset the balance between individual rights and communal necessities.

Concerning the criminal liability of internet service intermediaries, French case law has determined that internet service providers can be held criminally responsible based on their involvement or participation in a crime. On July 10, 1997, the Paris Court of First Instance ruled that an internet service provider's role in the spread of illegal content could be seen as involvement in the crime, necessitating their conviction alongside the primary offender. Similarly, on May 28, 1998, the Munich District Court found an internet service provider guilty as an accomplice in the crime of distributing child pornography online. The French legislator aligned with the overarching principles of the European directive on "e-commerce," as outlined in Article 6–1/3 of the French law on "Trust in Digital Economy". This article specifies that

wrongful actions by internet service providers cannot be subject to criminalization unless they possess actual knowledge of the illegal content and neglect to take suitable measures to eliminate it or at least restrict public access. Each nation anticipates that internet service providers operating within its jurisdiction will aid public authorities in the fight against cybercrime, adhering to these established conditions. Failing to act could lead them to be deemed liable for criminal involvement or complicity. Nevertheless, the Penal Codes of both Jordan and France specify that a conviction for involvement or criminal complicity requires the demonstration of actual knowledge regarding the acts committed. Thus, if it can be established that internet service providers lacked actual knowledge of the unlawful content or took steps to remove or restrict access upon realizing its illegality, their criminal intent is effectively negated [33, 20].

The Digital Millennium Copyright Act (DMCA) in the United States restricts the criminal liability of internet service providers concerning copyright violations online, holding them accountable only if they are aware of the unlawful nature of the digital content they either transmit or store. This awareness can be demonstrated in two scenarios: firstly, when the illegality is so evident that it cannot be overlooked, and secondly, when the service provider is informed by U.S. authorities or the affected party regarding the infringement. Upon gaining knowledge of such illegality, especially concerning counterfeit or pirated materials, the provider is obligated to take affirmative steps to eliminate the illegal content or at the very least, restrict public access to it. Neglecting to act in this manner constitutes a failure of their responsibilities, rendering them liable. Therefore, the standards for establishing and negating liability are consistent across American, French, and European law. Internet service providers must offer their clients a way to report any violations that occur on the network in order to be entirely free from criminal liability while aiding public authorities in the fight against intellectual property infringements, breaches of privacy, violations of religious sanctity, racial incitement, and child sexual exploitation. This requirement is outlined in Article 6–2/7 of the French law on "Trust in Digital Economy," aligning with Articles 13 and 14 of the European e-commerce directive and Article 512/g3 of the American DMCA. Once the service provider has confirmed the legitimacy of the report and the illegality of the electronic content, they are obligated to swiftly inform public authorities to secure an administrative or judicial order for the removal of the content or to restrict access for network users [21].

6 Conclusion

The criminal safeguarding of copyright stands out as an essential factor in protecting artistic and literary creativity amidst advancements in information technology and the digital landscape. By enacting robust laws and imposing significant penalties, it becomes feasible to reduce copyright violations and ensure adequate protection for creative works. Striking a balance between the rights of copyright holders and

the needs of society improves the effectiveness of this protection, fostering innovation while upholding the rights of creators. The findings of the study indicate that strengthening international collaboration and crafting legislation that addresses contemporary challenges is vital for fulfilling the objectives of criminal protection and creating a secure environment for creativity.

6.1 Results

The study concluded the following results:

- In both Jordan and Algeria, criminal laws offer robust safeguards for copyright, intending to discourage offenders with harsh penalties.
- Both French and American legislation govern the accountability of internet service providers by stipulating that they cannot be deemed liable for illegal activities unless it can be demonstrated that they had actual knowledge of those activities, highlighting the necessity of taking corrective measures once violations are identified.
- The way various laws tackle digital offenses and the safeguarding of intellectual property differs significantly, underscoring the necessity for global cooperation and cohesive legislation to enhance the effectiveness of protection.

6.2 Recommendations

This study recommends the following:

- Strengthen copyright-related criminal rules to cover all forms of digital infringement, with a particular focus on strengthening penalties for infringements.
- Standardize ISP liability internationally to facilitate cooperation in combating cybercrime and ensuring justice.
- Improve mechanisms for reporting illegal content online and provide ISPs with effective tools to facilitate the reporting process and take appropriate action immediately.

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Deep Dive into Malware Analysis and Their Behavior Patterns: A Systematic Technical Review



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Abstract The sophistication of malware attacks is always evolving. To circumvent common countermeasures and take advantage of vulnerabilities, they employ obfuscation, polymorphism effectively and anti-emulation strategies. Consequently, it is now crucial to conduct comprehensive malware analyses in order to identify and address threats promptly. Through a systematic assessment of state-of-the-art static and dynamic analysis approaches, this study aims to de-obfuscate, reverse-engineer, debug, and sandbox malware samples; identify communication infrastructure; categorize malware families; extract indicators; and grasp dissemination mechanisms. We construct a unified and repeatable malware analysis framework using tools such as IDA Pro, OllyDbg, Process Monitor, Wireshark, and nrdbg. This framework can break through anti-VM and heavily armored malware, hook into hidden processes, intercept system events, trace memory injections, log API calls, and sniff network activity. Fileless delivery chains and self-morphing processes anchored

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across networks of infected devices impact the filesystem, memory, registry, and native OS resources. Case studies classify popular malware like Dridex, WannaCry, Cerber, Trickbot, Poweliks, and Emotet based on these post-infection payloads. The proposed technique and toolset provide practical forensic analysis of modern exploit kits, worms, sniffers, keyloggers, ransomware, rootkits, and botnets by obstructing points of entry and attack areas on endpoint and network. These steps aid in reducing the scope of existing dangers, curing existing diseases, and warding off potential new ones.

Keywords Malware detection · Malicious software · Static analysis · Dynamic analysis · Technological progress

1 Introduction

Malware, or malicious software designed to infiltrate computer systems and networks, has become more prevalent in the digital era [1]. Malware can appear as worms, viruses, spyware, or ransomware, among other things. Inoperable systems, lost or stolen data, compromised privacy, and substantial financial losses are all possible outcomes. The development of effective detection, prevention, and cleanup strategies requires an understanding of malware behavior through behavioral analysis. With a focus on behavioral patterns, this paper conducts a comprehensive literature review of academic publications on malware analysis approaches. We provide an overview of common malware types and categories as well as a range of analysis techniques from static to dynamic and hybrid approaches. The challenges and restrictions of the current methods are looked at. Additionally, we highlight trends that can guide the development of strong anti-malware solutions by summarizing studies on common actions of malware families. This technical assessment broadens the expertise of researchers and computer security professionals who are battling ever-evolving malware threats. With behavior-centric detection, our research points to important prospects for the future development of malware analysis.

2 What is Malware Analysis?

The practice of analyzing, dissecting, and studying harmful software code to determine its impacts on targeted systems, how it operates, and how to prevent it is known as malware analysis. Cristian and you all. [1, 2] Static and dynamic methodologies are used by analysts to examine code, system calls, network activities, and behaviors when running malware samples in controlled conditions. Finding out how to infect people, cause damage that spreads, identify writers, develop defenses, and more is the aim. By enabling stronger defenses, accelerating threat detection, and linking cyber attacks to enhance prevention, malware analysis helps security teams. Dismantling

ever-more-complex malware that is created to secretly steal data, crash systems, or use equipment for illicit purposes takes specialist knowledge.

3 Why Malware Analysis?

Understanding malware analysis is crucial for addressing evolving threats to computer systems and networks. Traditional signature-based security solutions are becoming inadequate as malware attacks become more sophisticated and targeted. Rigid malware analysis, which includes static, dynamic, and code analysis in controlled environments, provides deeper insights into the mechanisms, strengths, weaknesses, and spread methods of malicious software. This analysis helps security personnel assess threats, pinpoint infections, develop detection and removal strategies, and effectively dismantle malware systems [3–5].

4 Static Analysis

1. Static Malware Analysis: This method examines malware's structure, instructions, dependencies, and code artifacts without execution. Tools like IDA Pro, x64dbg, and Ghidra help extract text, analyze function calls, uncover rootkits or backdoors, and identify communication infrastructure and malware families [b2, b4] [6, 7]. While it doesn't capture real-time behavior, static analysis reveals key indicators and inner workings of malware, complementing dynamic methods for a thorough analysis [b9, b4] [b8, b4].
2. Identifying the File Type: Recognizing the file type helps determine the target operating system and architecture. For Windows, malware often appears as Portable Executable (PE) files (.exe,.dll,.sys). Altered extensions may disguise files, but file signatures like MZ (hexadecimal 4D 5A) aid identification [3, 6, 8–11]. Manual verification using hex editors remains crucial for accuracy and detecting hidden threats [2, 7, 8, 11–13] (Fig. 1).

Identifying File Type Using Tools: Hex Editors allow analysts to inspect raw data, verifying magic numbers (digital fingerprints) at the file's start to determine its true nature [7, 8]. Tools like PE scanners and file viewers provide deeper insights into file names, sections, and import tables, revealing functionality and history [8]. Advanced tools, such as debugging utilities, are essential for uncovering malware hidden by packers and cryptographers, revealing malicious activities and processes [6]. Manual techniques, though labor-intensive, offer detailed control and insight that automated tools might miss, helping analysts understand and combat dynamic threats [14]. The CFF Explorer tool within the Explorer package facilitates PE editing without compromising the executable's integrity [9].

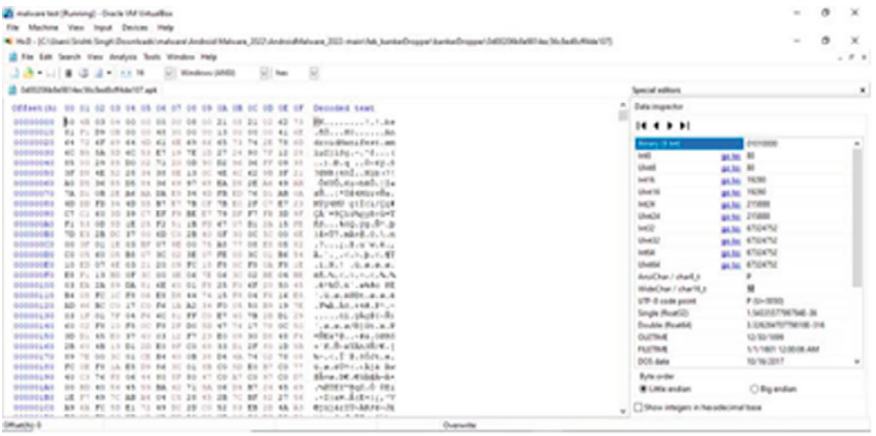
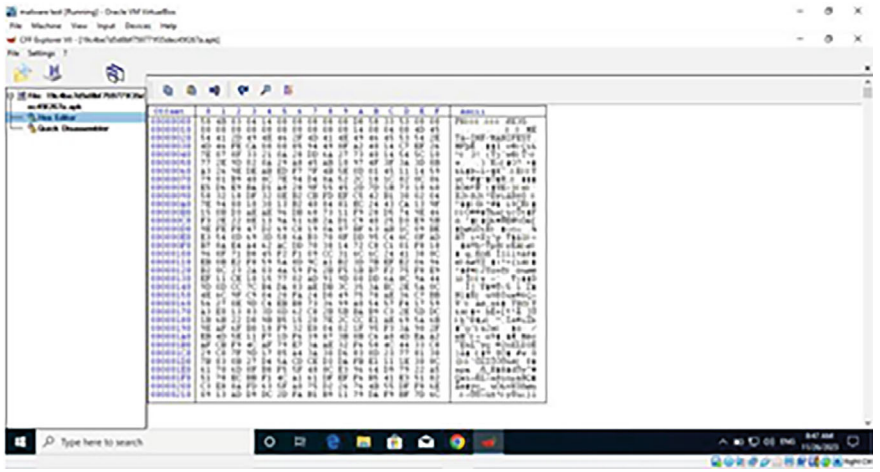


Fig. 1 Technical analysis of various files using manual analysis technique and tools



A. Using the Malware's fingerprints

Based on the contents of an untrusted binary file, fingerprinting entails generating a cryptographic hash value. It is widely accepted that using cryptographic hash methods like MD5, SHA1, or SHA256 to create data hashes for malware samples is the de facto norm. The usage of encryption hashes is seen in the list below [1, 15].

Malware patterns shouldn't be identified by file names alone, as names can vary, but the cryptographic hash of a file's content is consistent and acts as a unique identifier during verification [16].

Dynamic malware analysis can reveal if malware propagates or spreads additional threats. Knowing the cryptographic hash helps determine if the malware pattern is new or previously identified [16].

Security researchers use data hashes to track trends and search databases like VirusTotal for previously identified patterns [16].

B. Scanning for Viruses: Running malware through multiple antivirus applications is advisable, as different software uses varied signatures and heuristics. Antivirus tools might miss new or altered malware, so using services like VirusTotal, which scans with multiple engines and provides detailed reports, is beneficial [8, 17, 18].

C. String Extraction

Strings Extraction: Strings are printable character sequences in ASCII and Unicode within files. Extracting them can reveal insights into a process's performance and potential indicators of infection, such as filenames and IP addresses. Tools like the strings command on Linux and Pestudio for Windows facilitate this extraction [19, 20] (Fig. 2).

Decoding Obfuscated Strings: Malware often uses obfuscation to hide strings from detection tools. FLOSS can decode these obfuscated strings, making them readable and aiding in malware analysis [19, 20].

Obfuscation Techniques: Malware uses obfuscation methods like packing and cryptography to conceal its data. Packers compress and cryptors encrypt executable files, complicating analysis. Tools like Exeinfo PE can detect these methods and provide insights on decompressing files [8, 18–21].

PE Header Examination: Windows executables use the PE/COFF format, with the PE header containing crucial information such as memory locations and dependencies. Tools like PPEE, CFF Explorer, and PEBrowse Professional help analyze and modify PE headers to understand the binary's structure and functionality [8, 15] (Fig. 3).

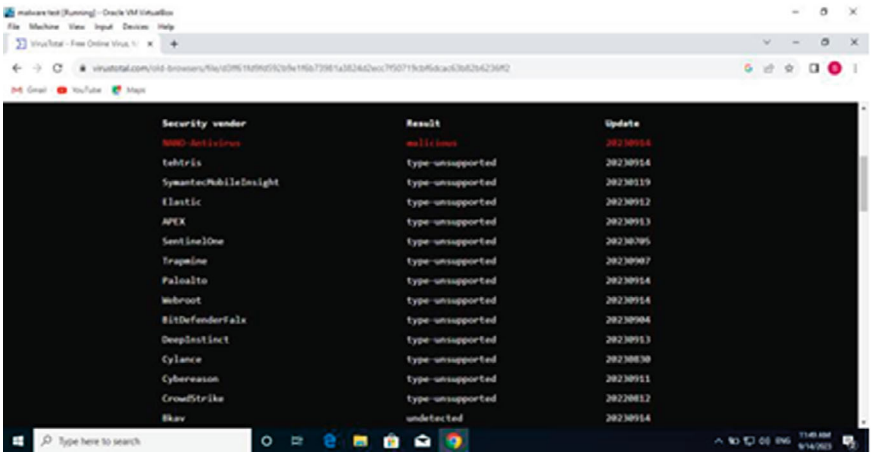


Fig. 2 Antivirus scanning using VirusTotal

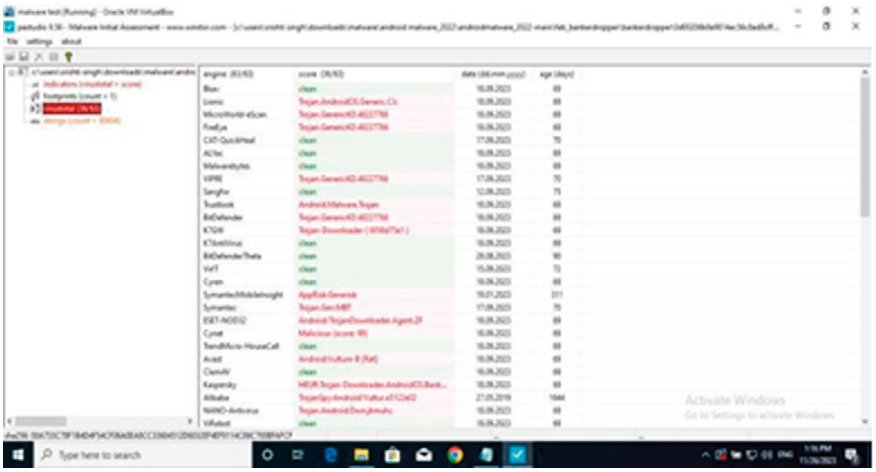


Fig. 3 Inspecting PE header

(1) Examining File Dependencies and Import: Generally, malware propagates via files, documents, networks, and other interactions. To execute such an attack, malware frequently depends on features that the operating system has made available. A large number of Windows functions, known as application programming interfaces (APIs), are exported. These APIs are necessary for interacting with dynamic link libraries (DLLs). These functions are regularly called by the executable through importation from multiple DLLs that offer distinct functionalities. An import function, sometimes known as an import, is the function that the executable loads from external files (only DLLs). For instance, the CreateFile() API relocated to the kernel32.dll file might be exploited by a malicious program for creating a file on the Windows drive. It must load kernel32.dll into memory before invoking the CreateFile() method for the purpose to access the application programming interface (API). You may get a feel of the capacity and potential of the malware as well as what to anticipate when it is run by looking at the DLLs the virus relies on and the application programming interface (API) functions it imports DLLs. Windows executable file dependencies are kept in the PE file model's import table. [8, 15, 22–25]

(2) Examining Exports: The first point for investigation is employing PE header tools such as CFF Explorer, PEView, and PE Studio to extract and evaluate the export table specifying ordinal numbers matched to export names or forwarded functions. Analysts evaluate this list of exports seeking for suspicious names that signal behaviors connected to malware activities like "dropper", "inject", "keylogger", or "ransom". They also examine exports against anticipated capabilities based on the supposed lawful software type searching for discrepancies or evident gaps suggesting efforts to conceal harmful code inside. Additional approaches decode obfuscated strings used in the name of exports by malware aiming to disguise its capabilities. Numbering sequences are traced in case

they relate to functionality not accessible by name alone. Finally, when exports forward to external DLLs rather than implementing locally, analysts recursively trace these forwarding chains to uncover dispersed capabilities across modules that malicious code commonly utilizes. The purpose of static export analysis is to methodically map the executable's declared functions and discover strange or suspicious characteristics that need additional study utilizing dynamic execution and monitoring techniques. Careful export evaluation gives the starting point to identify malware inner workings important for investigation and defenses.

(3) Analyzing the Compilation Timestamp: The date the malware was initially generated can be found by looking up this field in the PE header, which holds information about the binary's compilation. The timing of the attack can be ascertained with the help of this information. An attacker might also try to trick analysts into believing they are in a different time zone than they actually are. Sometimes strange trends might be found using cumulative times. A malware binary with a time change to the following day in 2020 is displayed in the sample below. In this instance, these signatures voluntarily assist you in recognizing unhealthy behaviors, even in the event that the precise timing is not detectable [9].

(4) Analyzing PE Resources: The executable's residual file (.rsrc) contains the resources (icons, menus, dialogs, and texts) that are needed by the executable. Examining the source can provide crucial information about the binaries because attackers frequently store information on devices, including decoy files, extra binaries, and configuration data. Additional informational resources with site names, company names, registration information, and credentials can be found in the Resources section. An excellent program for viewing and extracting resources from dubious binaries is Resource Hacker. Let's construct a binary file as an example that seems like an Excel file on disk (note how the file extension changes to.xls.exe), as demonstrated below. Three resources are provided when the binary is loaded into Resource Hacker (icon, binary, and icon group). The Microsoft Excel symbol is employed by this kind of malware (to display the Excel spreadsheet). Binaries are found in the executable as well; one of them has the data signature D0 CF 11 E0 A1 B1 1A E1. The file signature of a Microsoft Office file is represented by this string of characters. Here, the attacker leverages the device to store a counterfeit Excel file. When the virus is started, it operates in the background and offers the user an Excel trap form as a process. Right-click on the spot you wish to restore, select Save Source to *.bin File, to save the binary file to disk. Since the source in this example is saved as sample.xls, it presents the false Excel sheet that the user will see. Merely glancing at the item could disclose a lot about the qualities of infection [6, 8].

D. Analyzing and Categorizing the Malware

When you come across a malware pattern during malware detection, you can determine whether it belongs to a specific malware family or if its features correspond with past criteria. When suspicious binaries are compared to previously examined

samples or samples from public or private sources, information about the malware family, feature traits, and similarity to prior screen patterns can be found. While cryptographic hashing (MD5/SHA1/SHA256) is a great way to look for patterns that are similar, it is not a useful method for actually identifying patterns that are similar. Malware writers frequently alter just a small portion of the malware to alter the hash value as a whole. Some methods for comparing and categorizing untrusted binaries are covered in the section that follows [9, 15].

Classifying Malware Using Fuzzy Hashing: Fuzzy hashing is an innovative method that can detect similarities between malware samples despite minor modifications or obfuscations. This technique allows for faster threat identification and analysis but may encounter challenges like hash collisions. Nevertheless, it remains a powerful tool in combating cybercrime [19].

Classifying Malware Using Import Hashing: Import hashing, or imphash, calculates hashes based on the names of libraries and import functions (APIs) and their execution order. This method helps identify relationships between malware samples, although it may produce false positives when benign programs share libraries with malicious ones. Import hashing, combined with other methods, remains a valuable tool in tracking malware evolution [6, 10].

Classifying Malware Using Section Hashing: Section hashing focuses on specific parts of a file rather than the entire file, allowing for the detection of similarities between malware samples even with significant modifications. Although computationally expensive, this method provides researchers with a deeper understanding of malware's inner workings, aiding in accurate classification [6, 9, 10].

Labeling Malware Using YARA: YARA is an open-source tool used for malware classification and detection by matching specific strings or binary patterns found in malware samples. YARA rules help group related malware samples into families, accelerating analysis and defense development. Its flexibility in rule creation allows researchers to stay ahead in the evolving malware landscape [1, 7, 10, 12, 16, 20, 21].

5 Dynamic Analysis

In dynamic malware analysis, malware samples are performed in a monitored and instrumented environment so that the runtime behaviors and system interactions presented during execution may be examined. In order to establish strong monitoring and analysis capabilities without endangering production systems, analysts often use virtual machines, sandboxes, and emulators [5]. These dynamic analysis tools capture detailed system-level actions in real-time as malware runs, such as tracking system calls, calls to libraries and APIs, access to files and registry entries, network communications, process and memory alterations, and so forth. Malware processes can even be stopped in the middle of their execution and interactively debugged to retrieve more artifacts thanks to advanced dynamic capabilities [5]. Comprehensive activity reports that include information on files written, keys changed, domains linked, processes injected, system settings altered, and other observed behaviors during execution are

created from all of the observed activities. In order to comprehend malware payloads, identify compromised assets, ascertain lateral movement techniques, extract forensic evidence, and ultimately evaluate the gravity of dangers posed in the event that identical infections transpired in production environments, analysts examine these system state changes [5]. While static techniques focus on the malware code itself, dynamic techniques examine the actions and impacts of the malware, giving analysts access to information about attack payloads, exploits, and propagation strategies that cannot be found through static inspection alone. Additionally, dynamic outputs directly influence reaction and safeguards [5].

A. Tools for Dynamic Analysis and Monitoring

Dynamic Malware Analysis: This technique involves monitoring malware behavior during execution to gather insights safely. Key skills include tracking memory allocation, network communications, file/registry activities, system and function calls, and process monitoring. Advanced tools enable dynamic unpacking, instruction hooking, and interactive debugging [5, 8, 26, 27]. Examples include:

- ApateDNS: Spoofs DNS responses.
- Procmon: Records system events.
- Process Explorer: Visualizes process trees.
- Wireshark: Inspects network traffic.
- INetSim: Simulates services.

Cuckoo Sandbox: Automates execution, monitoring, and reporting.

Dynamic monitoring complements static analysis and reverse engineering, offering a comprehensive view of malware threats [5, 8, 26].

Process Inspection with Process Hacker: Provides real-time insights into CPU, memory, thread usage, and process connections, aiding in detecting suspicious activities and examining memory and registry changes [7, 8, 13, 16, 17, 21].

System Interaction with Process Monitor: Records real-time events like file access and registry changes, revealing malware interactions with the operating system and aiding in forensic analysis [7, 8, 13, 16, 17, 21].

Using Noriben: An open-source tool for logging system activities such as process creation and network connections. It integrates with Process Monitor and produces detailed CSV logs for analysis [7, 8, 13, 16, 17, 21].

Recording Network Traffic Using Wireshark: Captures and inspects network traffic to identify malicious communication and data exfiltration, providing valuable network forensics data [7, 8, 11, 13, 16, 17, 21–23, 28].

B. Examining Function Specifications

Examining function calls and parameters with great care is a crucial strategy in dynamic malware research to decipher activities that are disguised. We can log functions used by malware samples and examine values provided to them by using a debugger or instrumentation tool to trace API and system calls during execution. In order to infer capabilities enabled by function calls, parameters can offer context. Malware, for instance, uses the CreateFile API function to access files when the right

filenames and permissions arguments are supplied. We are able to identify potentially suspicious access attempts and extract accessible paths for additional examination by tracking CreateFile calls and parameter data. Deobfuscation is made easier by matching argument data to registers and stack variables through the use of dynamic call tracing in conjunction with static code disassembly. In general, understanding sequences of malware execution processes behind the hood requires careful monitoring of function calls, arguments, return values, and related branches. With packing, encryption, and encoding, it helps us defeat attempts to conceal intentions and capabilities. When trying to unpack malware and get to its main payloads, function tracing works best when combined with other dynamic analysis methods. [7, 8, 13, 16, 17, 21].

C. Monitoring Information Flow

Information flow tracking is a method used to track the data propagation during program execution in order to detect malicious activities that try to misuse or leak private information. One method of information flow tracking is dynamic taint analysis, which marks or "taints" data from dubious sources, such as user inputs or files, and then tracks how the tainted data propagates throughout the system when malware runs. Monitoring whether labeled data enters drains, such as network sockets, where it may be exfiltrated, is the aim. Taint propagation monitors values that are impacted by tainted data when they are written to memory, provided to functions, moved between processes, and other scenarios. For example, if we notice corrupted data being used in library calls in a way that suggests injection attempts, we can identify malicious data flows. Strong dynamic binary instrumentation tools, such as Valgrind and Intel Pin, capture detailed traces of execution to monitor the explicit and implicit flow of sensitive data through a system. Dynamic taint analysis is a useful tool in malware analysis since it can identify payloads, data theft pathways, and attacks that compromise system integrity or confidentiality. It is an information-focused addition to traditional dynamic tracing that helps to understand the capabilities of malware in relation to sensitive data. [7, 8, 13, 16, 17, 21].

(5) Purpose

A thorough technical review of scholarly literature focusing on malware analysis methodologies, in particular behavioral analysis techniques, is required in order to compile information about unique malware behavior patterns that can direct the development of more effective anti-malware programs and behavior-centric detection techniques to counter constantly changing threats. In summary, this review aims to advance behavior-based detection approaches against malware and raise awareness of current research on malware analysis methods targeting behavior patterns by outlining key directions and models based on typical capabilities exhibited by malware families in the wild. The paper emphasizes the drawbacks of the existing signature-focused approaches, emphasizes the need for in-depth malware analysis to fully understand evolving threats, gives a summary of common static and dynamic

analysis techniques, stresses the importance of behavior analysis, and recommends combining reported behavior markers and patterns to significantly enhance detection mechanisms going forward.

(6) Review of literature

The assessment highlights the growing concern of malware due to its increasing complexity, specialization, and difficulty to detect. It reviews advancements in analysis techniques and malware threats, focusing on behavioral models and their advantages and limitations. Key techniques such as hybrid approaches, dynamic tracking, and static analysis are summarized, with an emphasis on popular tools. Limitations include the ease of bypassing signature-based methods and the lack of multi-layered behavioral models. The proposed systematic review aims to address these gaps by compiling evidence on malware family behavior patterns to improve detection models, identifying research gaps, and suggesting a synthesis-based approach to enhance behavioral models.

6 Approach

The study presents a comprehensive malware analysis methodology that integrates both static and dynamic techniques. Static analysis involves steps such as file type identification, cryptographic hashing, antivirus scanning, text extraction, metadata examination, API dependency identification, and resource de-obfuscation using tools like hex editors and reverse engineering frameworks. Dynamic analysis complements this by using instrumented sandbox environments to monitor real-time malware behavior, including process activity, function calls, file/registry interactions, network traffic, and memory usage with tools like debuggers and system monitors. The goal is to gather forensic evidence, record infection sequences, and understand malware's impact on various system resources. By combining static and dynamic approaches, the methodology aims to connect data artifacts, uncover hidden functionalities, and analyze transmission paths, thereby enhancing detection and countermeasure strategies against both current and emerging threats. The proposed methodology's flowchart is illustrated in Fig. 4.

7 Results and Findings

By leveraging data from multiple sources, researchers analyzed behaviors and features of prominent malware like Stuxnet, Dridex, WannaCry, and Emotet, aiding network security. This is achieved through a combined static and dynamic analysis approach. Correlating signs such as system file modifications with mutation techniques helps identify malware families and predict future variants. Forensic examination of filesystems, registries, networks, memory, and APIs reveals complex

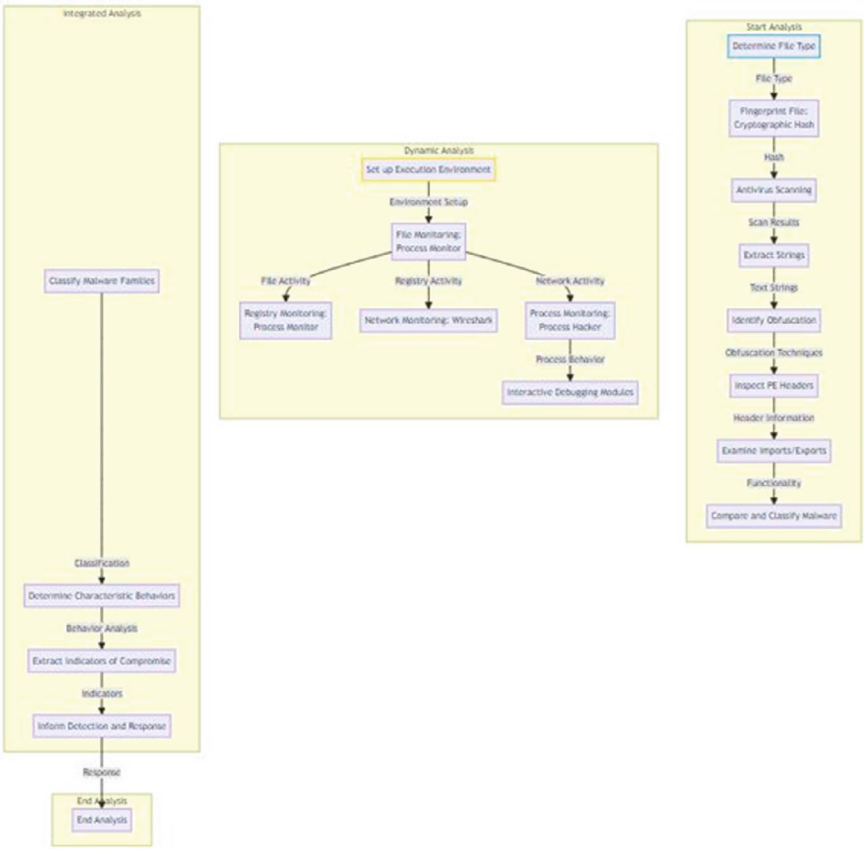


Fig. 4 Flowchart of suggested approach

attack pathways used by sophisticated malware. This comprehensive threat intelligence enhances detection procedures by addressing infection channels, behavioral markers, and exploit techniques. Additionally, the research informs response strategies by identifying dependencies that can be disrupted to counter current and future malware campaigns [29].

8 Conclusion

This research offers a systematic approach to analyzing modern malware by combining static and dynamic methods. It uses tools for debugging, monitoring, disassembly, and reverse engineering to provide insights into malware's behavior,

dependencies, and propagation techniques. This approach helps incident response teams assess threats, identify hidden infection stages, extract actionable indicators, and enhance protections. The methodology aims to improve proactive defense by providing the necessary intelligence to counter evolving malware threats.

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Securing the Cloud Environment: A Defense Mechanism Against DDoS Attack



Khushbu Dadhe, Hemraj Shobharam Lamkuche, Emma Qumsiyeh, and Ghassan Samara

Abstract The rising frequency and sophistication of Distributed Denial of Service (DDoS) attacks pose a substantial threat to service availability in the dynamic landscape of cloud computing. This study presents a complete defense strategy for dealing with the multifaceted issues offered by DDoS attacks in cloud environments. The study analyses and evaluates several tactics, such as source checking, multi-stage attack detection, and a novel text-based Turing test, to improve cloud service security. The study examines previous research on DDoS attacks in the context of cloud computing, examining various strategies and protection methods. In the literature, notable contributions include insights into low-rate DDoS attacks, extensive research on various types of DDoS attacks, and surveys on mitigation solutions based on machine learning, deep learning, and software-defined networking. The technique section discusses DDoS assaults, their functioning mechanisms, types, and their specific concerns in cloud computing systems. The suggested approach employs a hybrid cloud architecture with modules for source verification, attack detection, and a text-based Turing test. The system seeks to counter DDoS attacks efficiently while minimizing performance overhead.

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Keywords DDoS (distributed denial of service attack) · Multidimensional · Mitigation · Technological progress

1 Introduction

The prevalence and sophistication of Distributed Denial of Service (DDoS) assaults emerge as a formidable and developing danger in today's cloud computing world. DDoS assaults, which are defined as malicious attempts to interrupt service availability, pose significant challenges to the smooth operation of cloud systems. As more businesses rely on cloud platforms to supply services and store data, the requirement for robust DDoS protection techniques becomes critical in technological progress [1–5].

Cloud computing, defined as the delivery of hardware and software services via the internet, is an essential component of today's technological landscape. Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) are components of the architecture. As people rely more on cloud services, the necessity for strong security measures to protect against disruptive threats like DDoS attacks grows. The section on related work examines existing research on various elements of DDoS assaults in cloud computing. Several notable studies investigate various attack mechanisms, detection methods, and mitigation strategies, ranging from machine-learning approaches to software-defined networking solutions. These findings give a solid foundation for comprehending the issues faced by DDoS attacks and serve as the cornerstone for the suggested defense system.

The goal of this research study is to create a comprehensive defense mechanism against DDoS attacks in cloud environments. These attacks' increasing frequency and sophistication necessitate novel approaches to fortifying cloud services. The research looks at a multi-dimensional strategy that includes modules like source verification, multi-stage attack detection, and a novel text-based Turing test. A proactive and multifaceted strategy becomes increasingly important as the threat landscape evolves. By proposing a comprehensive defense strategy, this research study intends to add to the continuing discussion on cloud security. The following parts go into the methodology, proposed solution, implementation details, evaluation, and findings, providing a comprehensive picture of the study process and its outcomes. Through this investigation, we hope to provide valuable insights into protecting cloud services from the growing threat of DDoS attacks.

2 Related Work

The literature on DDoS (Distributed Denial of Service) attacks within cloud computing environments presents various approaches for detection, prevention, and mitigation. Potluri et al. [6] provide a comprehensive overview of DDoS attacks in

cloud computing, detailing detection techniques and prevention methods, including blockchain, deep learning, and machine learning approaches. These techniques are crucial given the complexity and severity of DDoS attacks, which can significantly disrupt services and cause business losses.

Neha et al. [7] focus on the challenges of detecting low-rate DDoS attacks, which are more difficult to identify than other types. Their work includes a detailed discussion of performance metrics for evaluating defense solutions in cloud environments and proposes various taxonomies for DDoS defense.

Somani et al. [8] delve into the EDoS (Economic Denial of Sustainability) attack, a primary form of DDoS in cloud settings. Their study compares various statistics and proposes new methods to counter DDoS attacks, offering future ideas for mitigation. Additionally, Somani et al. [9] present a framework that minimizes downtime following a DDoS attack, detailing the required resources and providing experimental results that demonstrate the effectiveness of different models.

Bakr et al. [10] conducted a survey on mitigation techniques against DDoS attacks, discussing issues related to DDoS in cloud environments and suggesting prevention techniques like MTD (Moving Target Defense), CAPTCHA, EDoS, and sPoW (Server Proof of Work). They also explore detection methods such as bot-cloud and anomaly-based detection, proposing a multi-layer solution for studying cloud computing data.

Saxena et al. [11] introduce Cloud Warrior, a system for filtering malicious traffic from legitimate traffic, and utilize the Weibull distribution to detect DDoS attacks effectively. Their study also covers IP spoofing and compares various performance metrics to validate their approach.

Velliangiri et al. [12] use deep learning, specifically a TEHO-based DBN (Deep Belief Network), to improve DDoS defense in cloud computing. By analyzing log files with classifiers, their approach effectively distinguishes DDoS attacks using different datasets.

Wani et al. [13] apply machine learning techniques such as Support Vector Machine (SVM), Naïve Bayes, and Random Forest to detect DDoS attacks. Their experimental setup compares these algorithms to determine which is most effective in real-world scenarios.

Bhushan et al. [14] discuss the role of SDN (Software Defined Networking) in DDoS detection, highlighting its ability to monitor and analyze traffic. They propose a flow table sharing technique to overcome SDN's limitations, along with a mathematical model for analyzing unused flow table space.

Lastly, Kushwah et al. [15] set up experiments to demonstrate that their proposed system can detect DDoS attacks with high accuracy, sensitivity, specificity, precision, and F-score, utilizing a machine learning approach to build a robust detection model for cloud environments.

3 Methodology

Background

a. Definition

A common recent attack is the denial-of-service (DoS) attack, which aims to prevent authorized users from accessing information or services. A more advanced variant is the distributed denial-of-service (DDoS) attack, where multiple compromised systems target a cloud system to crash it. Cloud computing combines hardware and software to provide services over a network like the Internet. It is categorized into three types:

- IaaS (Infrastructure as a Service): Provides access to networks, storage, and bandwidth.
- PaaS (Platform as a Service): Offers platforms and operating systems for application development.
- SaaS (Software as a Service): Grants access to software applications.

b. Working Mechanism of DDoS

A DDoS botnet is the heart of any DDoS attack (Fig. 1). A botnet is a network of hundreds or thousands of controlled machines, often known as zombies or bots, created by a malicious hacker. Attackers will gather these systems by identifying weak places that can be infected with malware through phishing attacks, advertising attacks, and other methods of mass infection.

The infected computers are waiting for remote instruction from a command-and-control server, the attack's command hub and frequently a hacker-infested machine. When launched, all these bots attempt to access a resource or service the victim has made available online. Each bot would have sent the victim harmless and ordinary inquiries and network traffic separately. However, because there are a variety of them,

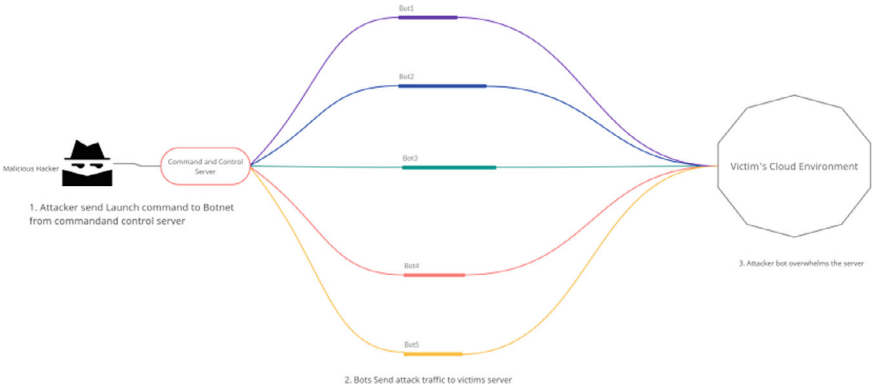


Fig. 1 How attackers use botnet

the requests frequently exceed the capabilities of the target system. Because the bots are typically just regular computers dispersed throughout the internet, blocking their traffic can be difficult or impossible without disconnecting reputable users (Fig. 2).

c. **Types**

Talking about the types of DDoS attacks that we commonly encounter in our day-to-day work.

1. Application layer attacks: These attacks often occur in the OSI model's top layer. In this type of attack, the attacker attempts to overload specific program features so that legitimate users cannot access or utilize the application. The top layer of the OSI architecture, which is being attacked, is understood to be responsible for all communications between web servers and browsers. When an application DDoS attack happens, the user may be impacted somehow by a site's slow loading time (Fig. 3).
2. Protocol attacks: Protocol attacks seek to exhaust the server's resources and its networking equipment, such as load balancers, routing engines, and firewalls. The SYN flood attack is one example of a protocol attack. Before a secure communication connection can be formed, two computers must perform a TCP handshake. Using a TCP handshake, two parties can communicate preliminary information. The TCP handshake is typically initiated by a SYN packet, which tells the server that the client desires to start a new channel. In a SYN flood attack, the attacker sends a huge number of SYN packets to the server, each with a faked IP address (Fig. 4).
3. Volumetric attacks: Vulnerability attacks are also known as "Network floods," and they include ICMP and UDP floods (UDP reflection attacks). Such an attack occurs when your applications/services are rendered unavailable to users due to a network being overrun by a large amount of malicious traffic. Although this type of assault is usually mentioned in terms of hundreds of gigabits per second (Gbps), few recent attacks have exceeded 1Tbps (Figs. 5 and 6).

d. **Why DDoS in Cloud Computing Is a Threat**

A DDOS is an organized, extensive attack target system or network bandwidth availability. DDoS attacks of many types are used to disrupt cloud services. Among these attacks are the ICMP (ping) flood, in which attackers send numerous erroneous pings to cloud servers; the HTTP GET Flood, in which attackers send a massive influx of requests to cloud servers and exhaust all available resources; and the IP spoofing attack, in which ICMP is used by echo request for packets to create a denial of service. Attackers seek to temporarily disrupt or halt a website's functions, rendering it unavailable. DDoS assaults are rapidly evolving and are aimed at large businesses, resulting in considerable financial losses for such companies and websites worldwide. As a result, it is critical to investigate DODS-related attacks on cloud systems and provide countermeasures against them.

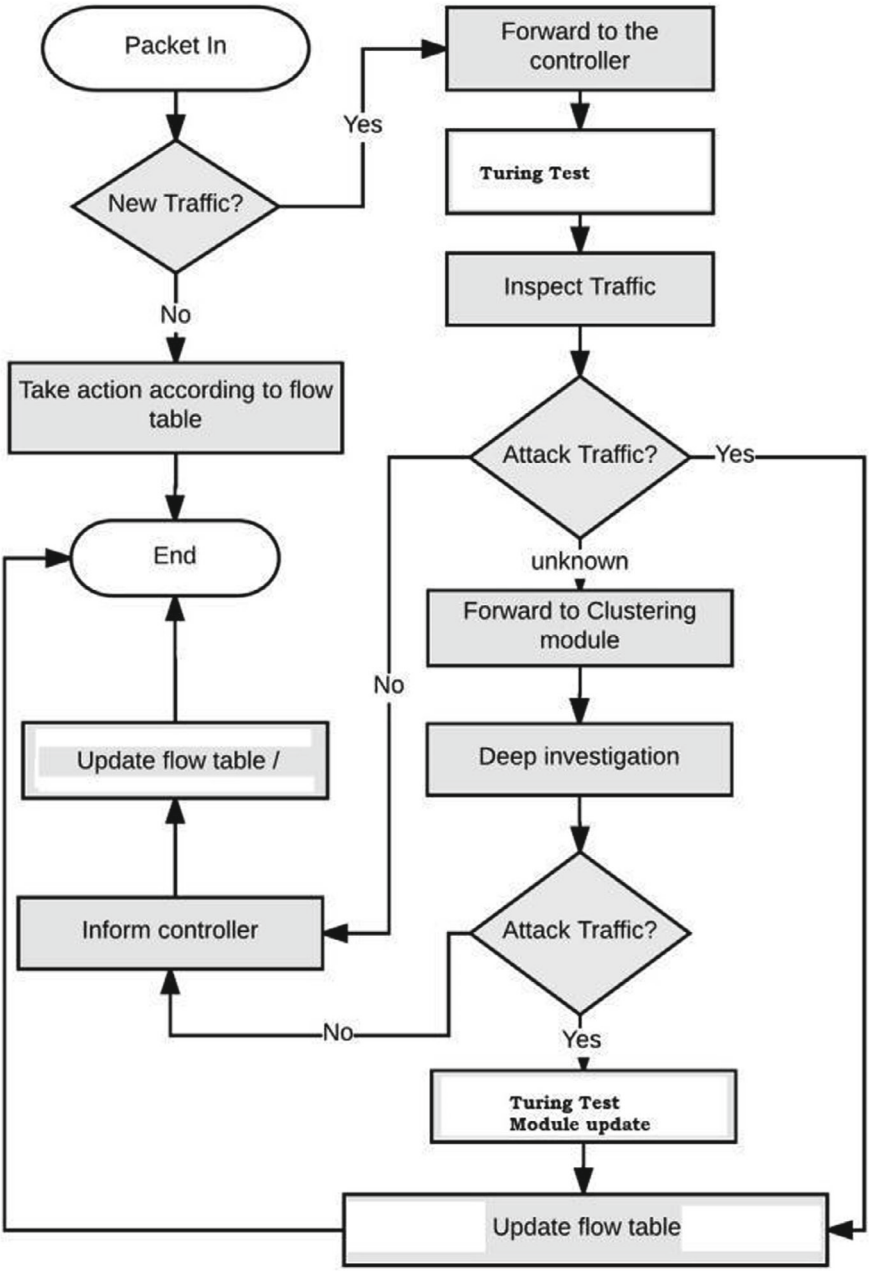


Fig. 2 Attack detection module

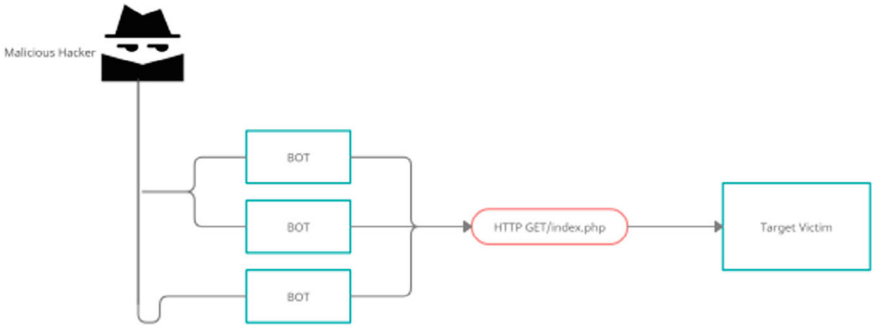


Fig. 3 Application layer



Fig. 4 Protocol attack



Fig. 5 Volumetric attack

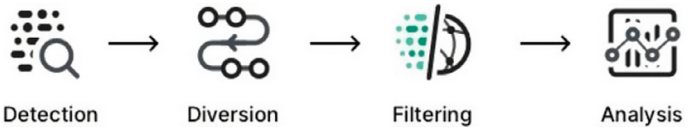


Fig. 6 Basic WorkFlow

Mitigation Tactic	Advantages	Disadvantages
Rate-limiting	• Easy to deploy and provision across network nodes • Flexible through dynamic threshold setting • Useful when detection has many false positives	• Coarse grain filtering also hitting legitimate traffic • Cannot completely eliminate the malicious traffic
Filtering	• Easy to deploy and provision across network node • Flexible through adding and removing addresses	• Cannot distinguish between malicious and legitimate traffic associated to the same sources • Difficult to detect all malicious addresses

Fig. 7 Advantages and disadvantages of DDOS mitigation tactics

DDoS Attacks Detection and Mitigation Techniques

DDoS attacks can be detected by monitoring unusual increases in network traffic, such as a surge in packets directed at a specific site. Detection can occur at the server level, through ISP monitoring, or at each router by observing incoming and outgoing traffic. To mitigate the attack, it's crucial to prevent erroneous packets from reaching their target. Although router-based flow analysis has limitations, it can be effective for detecting anomalies. Instead of investing in expensive hardware, an interoperable protocol with other routers can be used for detection. Rate-limiting and filtering are two common mitigation strategies. Rate-limiting involves reducing the volume of incoming attack packets to manageable levels while filtering focuses on eliminating attack traffic. However, filtering techniques may be restricted by law for public use, though they can be implemented within an organization (Fig. 7).

Problem Statement

DDoS attacks may threaten the operation of cloud services. Several efforts have been undertaken in recent years to identify DDoS assaults, which come in various flavors. The goal of this research is to reduce the severity of these attacks. The danger to the availability of Distributed Denial of Service (DDoS) attacks, as highlighted by Bakr et al. [10], plays a significant role in developing security architecture. A successful DDoS attack may cause service degradation or total outage. Due to various unique characteristics, cloud computing technologies can fundamentally change how we respond to a DDoS attack. DoS attacks aim to overwhelm active servers in such a way that the service is rendered unavailable due to an excessive volume of pending requests filling the service queue. A different flavor of DoS is Distributed DoS, or DDoS when the attackers are a group of devices aimed at a specific service. The frequency of documented DDoS occurrences is increasing, making it one of the most serious and deadly threats among many. Bhusan et al. [14]. The issue of restricted flow table space was also considered a limitation of OpenFlow switches in SDN. Therefore, this limitation can be exploited. DDoS attacks on the SDN-based cloud that use flow table overloading.

More than 20% of At least one known DDoS attack incident targets global enterprise infrastructure. The prediction shows an intense- anticipation that the DDoS attackers' focus has shifted to cloud infrastructure and services. Saxsena et al. [11] also said in his paper that these assault assumptions made in the research are supported by numerous attacks over the past two years. A few well-known attacks have garnered much attention in the research community among the many recent ones. On Christmas Day in 2015, Lizard [16] Squad hacked Microsoft and Sony's cloud-based gaming services, causing them to go offline. A significant DDoS attack was launched on Rackspace, a provider of cloud services. The cloud and SaaS (Software as a Service) industry have been the most often targeted DDoS targets in recent quarters, according to a report from iDefense Security Intelligence Services by Verisign.

Proposed Solution

A hybrid cloud architecture is recommended for cloud services based on the evolving threats and consequences of attacks. Figure 4 demonstrates the system flow. This is evidenced by the fact that our kernel's Source Check-in and Counting module will receive the packet initially after it arrives from the Internet. If the checked packet is suspect, it will be forwarded to the Turing test module. The Test module will test the requester by asking a text- based question of her or him; to pass the test and maintain her connections, the requester must provide the correct response. The Source Checking and Detection Module will search for any potential DDoS attacks. This system may be an effective way to counter DDoS attacks on a cloud computing environment.

a. **Architecture**

Counting and Checking Modules: This is the coordinating module for the entire system. The kernel Source Checking and Counting module will receive the Internet packet first. A packet in our system can be in different group lists. This module determines whether the incoming packet's source address is in which group. If the packet's originating address is on, say, group 1, it will be removed immediately. If the source/destination addresses are on the group, the packet will be forwarded to the Turing Test module. The Counting module will record the packet if it is not on either group 1 or group 2 list before forwarding it on to the destination. The Source, Destination, and Arrival Times fields of each packet are recorded by the Counting module.

Detection Module: This module aims to identify potential harmful sources and add them to group 2 lists. The Turing Test module will, therefore, attempt to challenge the malicious source addresses. The detection module gathers and saves information about each service's traffic patterns, including average and maximum values for connections made per second, incoming packet and byte rates, and more. As soon as we see a service is being targeted, we add its public IP to group 2 to prevent any more incoming HTTP connections to it. The public IP address for the service will be dropped from group 2. All new incoming HTTP requests will be routed to the Testing module until they successfully complete the challenge, which will reduce traffic. Up until its traffic is reduced, the group 2 list will repeatedly add and remove

the Service's public IP address. The IaaS must enable the technology of auto-scaling in order to provide more resources, such as more network bandwidth or more virtual machines, to meet the demand if the volume of traffic continues to be extremely high.

Testing Module: This module's primary duty is to choose a question at random from the question pool and transmit the text-based query to the requester. The next step would be determining whether the requester's response is accurate. The requester cannot go to its intended location until it provides the correct response to the challenged inquiry. Question Generation Module: This module's primary duty is to generate text-based questions at random to test the alleged requester in the Turing Test module. The most popular Turing test technique that many websites employ to stop robots from launching brute-force attacks is CAPTCHA. The majority of websites use image-based challenges to determine whether the requester is a person or a robot. A challenge with an image component calls for increased network transmission bandwidth. When we input the wrong password more than five times, the Gmail login screen displays a challenging image with a size of about 3 Kbytes. When compared to Gmail, this module's text-based Turing test question requires less than 1/10 the bandwidth, or roughly 200 bytes, to challenge a requester (Fig. 8).

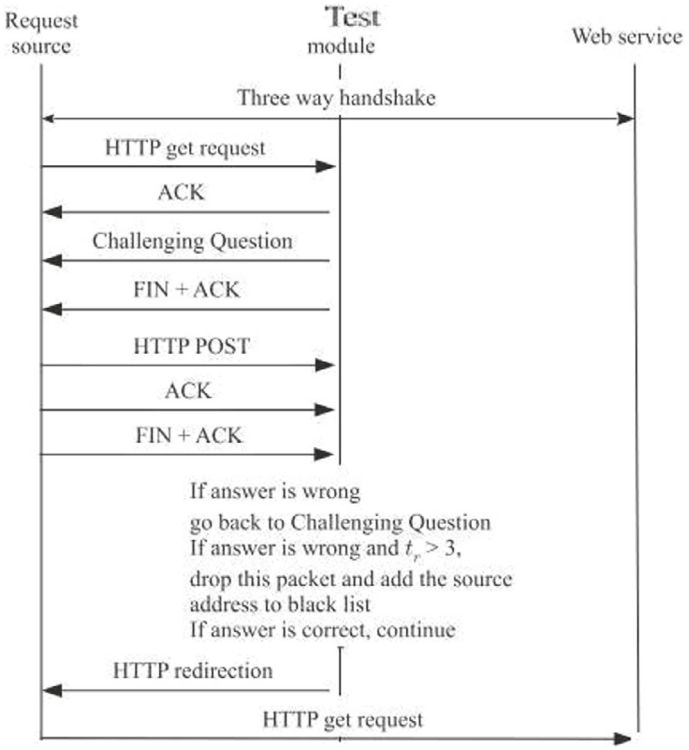


Fig. 8 Work flow

b. **Implementation**

We utilized the open-source program Wireshark to record Internet traffic. All digital data received or transferred through various devices, such as Ethernet or Wi-Fi devices, can be captured using Wireshark. Additionally, it facilitates protocol packet identification within the Data Link Layer's wrapper packet (e.g., TCP, UDP). Instead of creating a bot program for our simulation, we used the Low Orbit Ion Canon tool, a free DDoS attack launcher. Even attackers use this tool to launch DDoS attacks in the real world. We have built a modest network with one router and a few host computers to illustrate our methodology. Any device could fall victim to a DDoS attack. The Wireshark utility was installed on one of the computers in this network. Wireshark's ability to record all network traffic was employed for network traffic capturing. This configuration is comparable to an Internet router, which collects all the traffic traveling through it to various destinations. The same was used to record all of the legitimate and malicious traffic. In the specified network, packets are collected for around five hours. The packets were stored as pcapng files after being recorded, which is a Wireshark file format for captured packets. On the file system, when packets were collected at that time, normal traffic and an attack were preserved separately. A Python data extraction application was created to extract the IP layer data from a captured packet. This software retrieves the IP address, port, and time from each IP packet that is collected. We established a test-bed that included (Figs. 9, 10 and 11):

(1) A server that performs our DDoS attack reduction, along with the web service undergoing test, which does nothing but deliver a short static HTML file to reduce communication costs between them. (2) To generate white input loads, a white input load generator that employs the stress testing software ab, which is configured to run 100 concurrent threads with 1000 requests per thread and targets the web service deployed on the aforementioned server, is utilized. (3) A grey input load generator

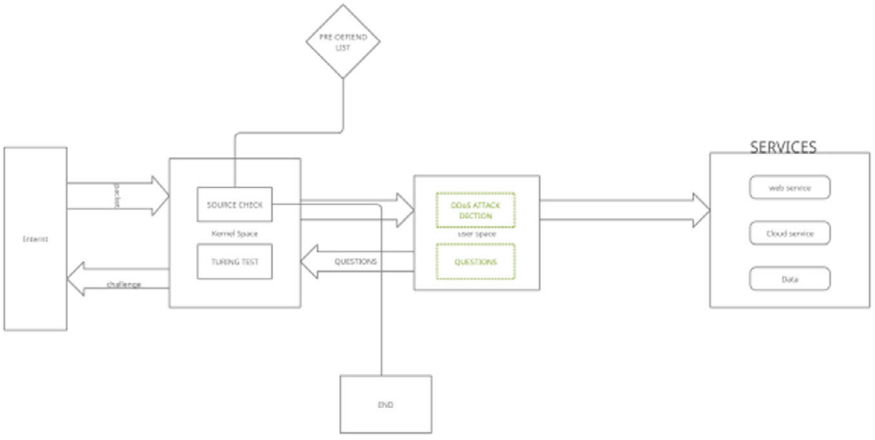


Fig. 9 Work flow

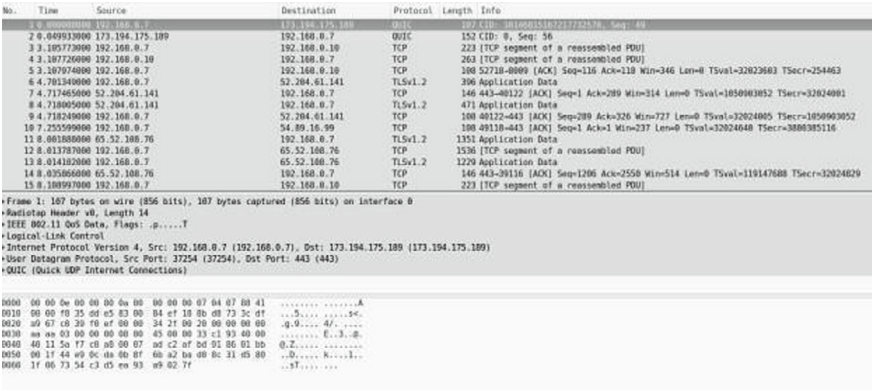


Fig. 10 Wireshark

Destination IP	Protocol	Time stamp
52.6.129.72	6	1512094785.93
192.168.0.4	6	1512094785.95
192.168.0.4	17	1512094786.14

Fig. 11 Collection sample

node that regularly issues requests to the web service under test, and (4) A black or attack load generator node running a raw socket program that generates a huge number of HTTP request packets flow capturing: We must first collect the flow data within a time range that will be set at the beginning in order to do the analysis. As a result, a flow will include all of the packets that are sent from a router to various destinations throughout the course of 300 s. Such flows can also be combined to create a new flow with wider time spans. As soon as we get flow information, we may iteratively apply learning techniques to each flow to learn more about the flow's typical behavior. For instance, on average, how many packets of various protocols are leaving from a given router or location at a particular hour of the day?

4 Evaluation

The overhead of inspecting each incoming packet to see if it is on the black list, white list, source/destination list, frequency of invoking challenge-response interactions, and overhead of each challenge-response interaction are the main factors affecting the DDoS attack mitigation system's performance cost. The Attack Detection module can run on a separate machine without interfering with the traffic gateway's performance. These nodes are connected by a gigabit Ethernet switch. We begin by computing the proportionate cost of looking up the black list, Fig. 12 line 1 shows the throughput (number of requests successfully processed per second) of the test web service when just the white input load generator node, which is not in the black list, sends input requests. Even with a 100,000-entry black list, the black list is organized as a hash table, resulting in a 4.4% reduction in throughput when compared to the configuration with the DDoS attack mitigation strategy turned off (No DDoS). Figure 12 indicates that the DDoS attack mitigation system is effective at intercepting assault packets early on, resulting in a throughput decrease of no more than 8.5% from DDoS attacks when the blacklist size surpasses 100,000.

In contrast to the "No DDoS" situation, Fig. 13 demonstrates that even though the DDoS attack mitigation system must send out 10,000 challenge questions per second, the test web services performance reduction is just 7.3%. Furthermore, the throughput loss is stopped when the grey input load generator is added to the black list and then blocked (Blocked). The effects of two different challenge question sizes, 200–300 bytes, and 1000 bytes, on performance, are compared.

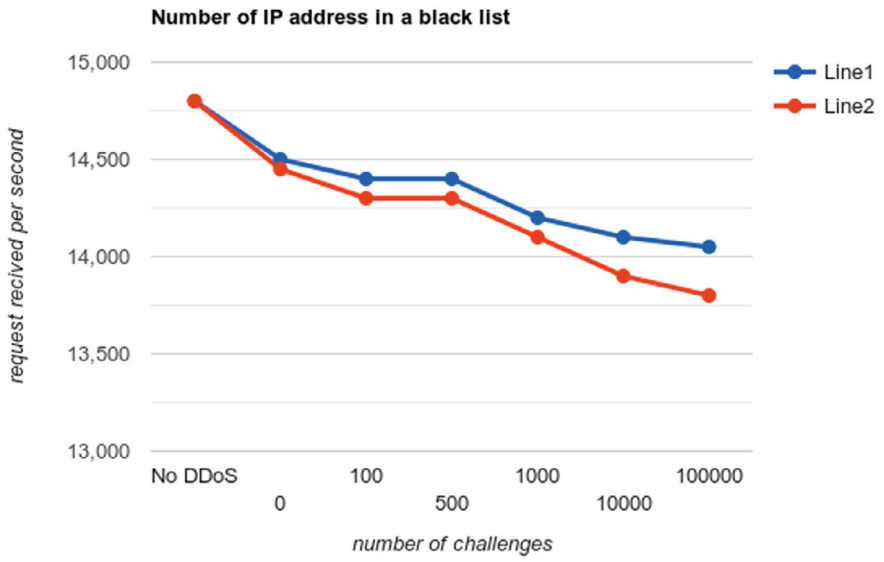


Fig. 12 Data

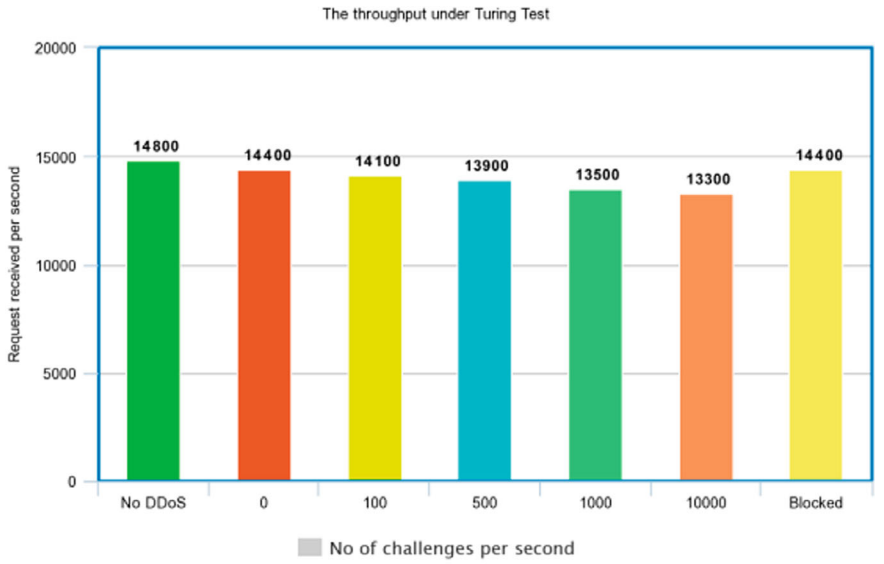


Fig. 13 Data

The text-based Turing test appears to be promising. In comparison, the challenge question on the Google Gmail login screen is approximately 3 Kbytes in size.

5 Results

Source-based Checking and Counting, Multi-Stage Attack Detection, Text-Based Turing Test, and Question Generation modules comprise the DDoS security and system we presented. When input and its requests come from known valid and authorized users only, known good users and known bad users, invalid users, and potential attackers, this DDoS attack mitigation technology successfully defends a web service. The advice was text-based and Turing test stops the Turing test from unwittingly aiding a DDoS attack.

6 Conclusion

In conclusion, the research presents an approach for improving DDoS defense in cloud computing environments using a hybrid cloud architecture. The architecture incorporates a multi-module system that includes modules for source checking and counting, detection, testing, and question generation. By categorizing incoming

packets, challenging possibly hostile sources, and conducting text-based Turing tests, the presented system intends to find and mitigate DDoS attacks quickly. The evaluation component of the study exhibits the suggested solution's effectiveness in mitigating DDoS attacks, demonstrating its ability to reduce throughput losses even in the presence of huge blacklists and significant challenge-response interactions. The results highlight the system's capacity to adapt to changing challenge question sizes while maintaining a balance of security and performance.

This research study, in essence, presents a complete review of DDoS attacks in cloud computing, providing useful insights into existing protection mechanisms and suggesting a new hybrid cloud architecture for increased security. As the DDoS attacks increase, the data of this study help to strengthen cloud environments against cyber threats, assuring the continued delivery of services to customers and enterprises alike.

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The Role of Virtual Reality in Promoting Psychological Well-Being in Educational Environments



Adnan Hassan Alsarayreh

Abstract The following is an exploratory investigation regarding the use of VR in promoting mental health from a variety of perspectives, but all hinge on the ability of VR to provide immersive and interactive experiences that strike well with students and educators. It uses a systematic qualitative research approach by reviewing existing literature, including empirical studies, theoretical frameworks and practical applications related to psychological benefits using VR technology. Results showed great potential for VR environments in helping emotional regulation, reducing symptoms of anxiety and increasing general well-being through innovative interventions such as biofeedback video games and virtual harmony music therapy. This paper ends with insights drawn from the integration of VR into educational settings for enhanced psychological well-being—understanding that it acts as a transformative tool in the areas of mental health and education.

Keywords Virtual reality · Psychological well-being · Education · Mental health · Immersive experiences · Emotional regulation · Anxiety reduction · Biofeedback · Virtual harmony music therapy · Qualitative research

1 Introduction

The introduction section offers a comprehensive overview of how virtual reality (VR) contributes to enhancing psychological well-being within educational settings. Noteworthy for its ability to deliver immersive and interactive experiences, VR technology has attracted attention due to its positive effects on mental health. By focusing on the use of VR technological tools in mental health care, replicating real-life settings and generating auditory, visual and tactile scenes with fidelity to this section initiates

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the discussion that will justify the relevance of VR applications within educational scenarios: psychological well-being. Moreover, it introduces the incorporation of dance and music into virtual environments for enhancing therapy practices as well parallel with VR technologies introduction (e.g., Virtual Harmony Music Therapy) for reducing levels of stress and anxiety.

Moreover, this section identifies the potential of VR technology in enhancing emotional regulation through such interventions as discussed among others biofeedback video games and web-based reflective applications. The following introduction will discuss further on how varied use and benefits of VR technology can enhance psychological wellness within an educational set up.

1.1 Background

The realm of education has witnessed an increasing number of stakeholders interested in Virtual Reality Technology due to its potential to facilitate richer learning experiences. There is proof that the integration of VR technology into education improves presence, motivation, engagement and learners' capacities as some studies have reported [1, 2]. Research comparing traditional videoconferencing tools with Social VR platforms reveals that VR viewing fosters higher levels of social presence, suggesting that VR can positively affect attitudes and behaviors within educational contexts. Moreover, VR technology has been investigated for its role in mental health treatment, with uses such as virtual harmony music therapy aimed at alleviating anxiety and stress, along with psychological relaxation systems designed for those suffering from insomnia and postpartum depression [1]. Although VR technology holds promise in the realm of mental health, additional research is essential to enhance its efficacy and to prioritize effective treatment strategies over technical considerations. These advancements underscore the potential of VR to support psychological well-being in educational settings, emphasizing the importance of ongoing exploration and enhancement in both educational and mental health applications.

1.2 Methodology

It is a qualitative study that explores the contribution of virtual reality towards achieving psychological well-being from the perspective of educational environments. A descriptive approach will be taken in reviewing related literature systematically, drawing much strength from existing theories, empirical studies and practical applications of VR in addressing education that have been done before. This will form a basis for understanding how VR technology affects psychological well-being of students and teachers. An analytical approach is used after data description to interpret it by identifying key themes and patterns regarding psychological impacts related explicitly to well-being development resulting from the use of VR. The reason

is that such a dual methodology will go a long way in ensuring that there is an adequate exploration of research-related factors underpinning the effectiveness contribution of VR technology toward enhancing well-being in educational settings. The findings are research-informed insights and recommendations for facilitating mental health support and well-being through the appropriate integration of virtual reality into education.

1.3 Research Significance

The significance of psychological well-being within educational environments is immense and cannot be emphasized enough. It is vital to prioritize students' well-being, as numerous studies have repeatedly demonstrated a strong correlation between student welfare and factors such as academic achievement, sense of agency, communication skills, self-esteem, confidence and community involvement. Therefore, educational institutions must focus on promoting and nurturing the mental and emotional health of their students. Additionally, the well-being of teachers holds equal importance in establishing a positive and safe classroom atmosphere for learners. Educators who maintain their psychological health play a crucial role in creating an environment that supports and uplifts student well-being. In providing teachers with the tools and backing toward better mental health, educational institutions can create a setup entailing holistic development for both students and facilitators. Secondly, it is important to realize the undeniable link between well-being and learning. Understanding that student welfare and academic success are interconnected and mutually reliant is crucial. When students are provided with mental or emotional support they tend to get involved in their education which leads to good academic results therefore there is a need for educational institutions to implement a comprehensive approach that recognizes the importance of both learning and well-being, thereby giving each enough priority for the overall growth and development of students. The importance of mental health within educational settings cannot be overemphasized in acknowledging the relationship between student well-being, successful academics; equally important is considering the impact this has on creating a positive classroom climate. By focusing on the well-being of both students and teachers, educational institutions can create an environment that encourages comprehensive development and establishes the groundwork for lasting success.

In accordance with this thorough comprehension, the increasing recognition, appreciation and acceptance of groundbreaking virtual reality (VR) technology in educational settings is becoming widespread among experts, educators, scholars and researchers. This state-of-the-art VR technology, with its astonishing capabilities, empowers the creation, development and execution of exceptionally immersive, engaging, and transformative experiences. Such experiences can effectively and effortlessly facilitate the application of highly efficient and invaluable emotion regulation techniques and strategies, leading to significant and positively impactful

advancements in the comprehensive realm of mental health, as well as in individuals' subjective well-being and satisfaction. By leveraging the essential and powerful VR technology, dedicated and passionate researchers and educators can thoroughly measure, evaluate, explore and analyze a range of crucial cognitive, emotional, physiological and behavioral responses and dynamics. Operating in real time, they provide a unique and invaluable platform for actively promoting psychological well-being and flourishing in both formal and informal educational environments, free from limitations or constraints [3].

2 Understanding Psychological Well-Being

Psychological well-being includes multiple facets, such as autonomy, mastery of one's environment, personal development, positive relationships with others, a sense of purpose in life and self-acceptance, as indicated by the Subjective Happiness Scale [3]. Also, the MPQ Well-being scale evaluates positive and negative emotional temperaments, constraint and absorption and thus provides insights related to sanguine and melancholic aspects of the individual. The DASS and also the ERQ are important tools for assessing emotional regulation and well-being. In academia, Virtual Reality Technology has been proven capable of promoting psychological wellness in interventions such as virtual harmony music therapy and psychological relaxation systems [3].

2.1 Definition and Components of Psychological Well-Being

Psychological well-being is made up of multiple components that strongly influence an individual's total mental health. These dimensions are emotional stability, self-acceptance, personal growth, purpose in life, good relationships with others and autonomy. In school settings, the identification and nurturing of these dimensions are important for the healthy growth of students in a holistic sense. The use of Virtual Reality (VR) technology has been explored in psychological research by creating "out-of-body experiences," inducing "self-consciousness" which indicates its potential application toward enhancing psychological well-being. By introducing VR technology into educational programs, immersive experiences can be created which cater to various components of psychological well-being such as improvement in self-awareness, emotional regulation, interpersonal skills as well as resilience during tough times. This would be in line with promoting subjective well-being as a valid approach for better mental health and instilling a sense of purpose and meaning into students' lives. Hence, the integration of VR within educational settings not only addresses but is a promising and challenging channel to address the intricate nature of psychological well-being, boost mental health of students and equip them with prerequisite skill-sets for success in an ever-evolving environment [3] 4.

2.2 Theoretical Frameworks for Assessing Psychological Well-Being

The psychological assessment of well-being in educational setting: a theoretical framework and models is informed by a variety of theoretical frameworks and models which are vital for understanding and evaluation of well-being. Virtual reality has been widely used in many different ways to increase wellness among both healthy individuals as well as clinical populations resulting in great success. Several research studies have reported the excellent effectiveness of VR for pain management, enhancement of emotion regulation skills, reduction on symptoms related to anxiety, depression and stress. For instance by integrating VR with advanced biofeedback systems like game-based biofeedback and neurofeedback it has shown to be very effective leading into such positive impacts related to both physical and mental health. In addition interventions also exist designed specifically toward improving ICT skills thereby supporting social functioning by enhancing well-being amongst elderly people. Moreover, an up-to-date research carried out in 2020 has finally proven VR-based interactive feedback program to be a valid intervention tool for promoting subjective well-being, thus in the process reemphasizing the vitality of VR technology in improving mental health. Such revolutionary findings further underline with a high degree of boldness VR's vast potential to bring considerable positive changes on the psychological wellness of individuals placed within educational settings [5].

3 Benefits of Virtual Reality in Education

Virtual reality has very many advantages when used in the education sector, especially by increasing student engagement and immersion. Emotional interactions are promoted by VR; thus, learners can connect with the content to be learned on a much deeper level [5]. Students are able to interact with virtual settings, characters and situations so that their understanding is enriched, coupled with emotional involvement in the learning materials. Moreover, it can create real virtual classrooms where students attend lectures and work with other classmates or virtual instructors [6]. The interactivity and immersion bring about a more interesting and efficient way of learning for students whether in an asynchronous or synchronous environment.

3.1 Enhanced Engagement and Immersion

VR offers many opportunities for affective interaction: students can actively engage with virtual characters and elements in the digital space [7]. This kind of engagement helps learners feel emotionally connected to the learning content, making it more

interesting, memorable and impactful. VR is also useful for enhancing educational experiences in literature. With VR, students can enter the world of virtual literature through role-playing activities. Not only does this help students better understand literary works, but it also fosters affective engagement by bringing stories to life as students act out different characters and interact with virtual literary environments. Furthermore, through VR technology, learners can be taken to a number of different places; this helps them relate theory to practice and understand various concepts better. Within this area, VR brings a unique opportunity for students to see and visualize theoretical concepts in an interactive three-dimensional environment [7]. This approach to experiential learning will allow a deeper understanding and more engagement since students can go through, handle and run into a virtual setting of the real-world subject being taught in their academic journey. The use of VR interventions as educational resources has shown great promise in enhancing overall engagement, knowledge retention and acquisition. Because it offers such a unique dynamic learning experience, VR has the ability to revolutionize online training programs by providing this interactivity resulting from what traditional online education has been missing as an aspect of experiential learning. Moreover, empathy is encouraged by VR since students can 'step into' other people's shoes and obtain first-hand experiences with different perspectives; thus promoting understanding and compassion among individuals. In conclusion, the incorporation of VR technology in educational settings has proved very advantageous in increasing engagement as well as deepening understanding and fostering experiential learning. By nature, virtual reality allows learners to engage, explore and learn through experience in a way not possible with conventional methodologies. As we move forward with VR technology, it will revolutionize the education and training industry by providing students with an interesting and memorable learning experience among different domains.

3.2 Personalized Learning Experiences

Virtual reality technology is revolutionizing personalized learning and has made its way into the landscape of educational environments, transforming how students learn. This development allows for fine-tuning and adapting learning contexts to the specific needs and liking of each individual learner. By producing three-dimensional replicas of real environments, VR creates real-world learning tasks for higher education learners. New findings indicate that VR increases immersion and acts as a cheap tool for teachers to deliver lessons in which students show more interest [8]. Moreover, research findings have shown that those schooled under VR conditions have memorization that is better than those who are schooled under the traditional system, higher positive emotions, lesser negative emotions and greater engagement on the basis of information imparted when compared with those under traditional educational methods. The use of virtual reality in technological equipment within curricula shows great promise in meeting different types of student learners' information needs and improving their total educational experience.

4 Applications of Virtual Reality for Psychological Well-Being

Virtual reality has emerged as a useful tool in creating relaxation and stress relief through the provision of educational settings [9]. Discuss two key approaches to implementing VR in this scenario. The first approach is to create virtual environments with general context and soothing stories that help individuals deal with their physiological responses. The second approach is placing individuals in VR-driven scenarios that allow them to regulate emotional responses. Additionally, the authors propose a novel user-centered technique using customized VR experiences based on major life events, aiming to capture individualized aspects of those events within virtual environments toward possibly stronger and longer-lasting relaxation benefits for users.

Virtual reality in enhancing mental wellness is a concept that seems to have very positive implications for addressing stress and anxiety in educational contexts by introducing innovative ways of enhancing mindfulness and other emotion management techniques.

4.1 Stress and Anxiety Reduction Techniques

The research on VR for stress and anxiety in educational settings has just begun. A meta-analysis found that VR interventions are likely to be more successful than classical ones, as they provoke an even larger IES-updating [9]. VR interventions significantly decrease students' anxiety and stress levels. For instance, VRS ability to elicit a state of social stress in participants, with the TSSS-VR being a frequently employed methodology [10]. Also explored was the feasibility of custom 360° VR experiences created for stress relief containing bespoke virtual environments such as a private beach, or perhaps a waterfall within a cave, outer space travel and northern lights watching experience [11]. These immersive experiences have proven efficient in reducing stress conditions as indicated by both Electroencephalography (EEG) measures self-reported questionnaires. The adoption of VR in relieving stress from students in an educational environment is an innovative way of improving their mental health.

4.2 Mindfulness and Meditation Practices

The use of virtual reality (VR) to enhance mindfulness and meditation practices in educational contexts has been on the rise [11] points out that the way VR applications are designed can affect the audio experience, interaction levels and the virtual surroundings, which may lead to meaningful changes in users' mindfulness. This

highlights the necessity of clearly identifying the VR applications employed in studies to confirm their effectiveness in fostering mindfulness. Furthermore, [12] presented findings indicating that mindfulness meditation can enhance cognitive functions, revealing variations in psychological and physiological reactions to stress between those engaging in immersive VR mindfulness meditation and control groups. These findings underline the promising role of VR-based mindfulness interventions in supporting mental health and cognitive development within educational settings.

5 Challenges and Considerations

The infusion of VR technology in educational settings elicits a myriad of challenges and considerations. All these must be handled very carefully. Among the top priority issues are the ethical concerns related to the use of VR in delivering education and other related services, including student safety [13]. The issue of student privacy and data gathered or generated during learning activities within virtual environments also needs to be given due attention, to ensure protection of the learner's rights. Considering technological barriers: that learners have to be provided with VR equipment; these technologies have to be accessible for students with disabilities—is extremely important when integrating VR into educational curricula [13]. Moreover, successful adoption in different cultural settings demands a good understanding of user acceptance as well as determinants shaping intentions toward vast populations. This underscores the need for culture and region-specific customization of strategies of VR integration, emphasizing on the other hand the importance of user self-efficacy, performance expectancy, effort expectancy and social influence in different settings. Addressing these problems and taking into account these aspects is essential for implementing VR technology in educational environments in an ethical and effective way.

5.1 Ethical and Privacy Concerns

When incorporating virtual reality into educational settings, ethical and privacy considerations have to be at the forefront. Thereafter, the implementation of VR technology for whatever purpose ushers in attendant ethical challenges of a weighty nature and privacy problems that loom large [14]. The researcher shall ditch efforts in an area surrounding possible privacy invasions in VR user research, safety measures which include more than must be observed with fresh strictness for social VR contexts plus the need for universal standards of misbehavior and harassment between real as well as virtual settings. More also boundary-aware design is an emerging yet underexplored topic which might improve interactions between people in VR environments [14].

In integrating VR into the educational environment, both educational institutions and developers of VR technology should take into account these ethical and privacy-related concerns. This will help in advancing responsible and safe use of VR technology, thereby facilitating a positive and secure VR environment that reflects community norms and discussions of safety in social VR.

5.2 Technological Limitations and Accessibility Issues

Prominent among the technological barriers and concerns about accessibility that stand in the way of widespread adoption of virtual reality (VR) in educational contexts are motion-sickness problems. The problem with VR technology is that users can experience motion sickness, which happens as a result of the mismatch between rendered visual cues and head motions made by the user, as well as delays between displayed content and actual head movements within the environment. Such an issue may lead to accidents in the virtual world and harm users' presence as well as engagement with learning activities. Additionally, findings show that current Social VR platforms have worse usability than traditional videoconferencing systems, despite providing higher levels of social presence and enjoyment [15].

These challenges and constraints underscore the necessity for additional research and development to tackle problems like motion sickness and usability in virtual reality technology, promoting fair access and efficient use in educational settings.

6 Case Studies and Research Findings

Empirical evidence from research findings and case studies illustrates the effects of virtual reality (VR) interventions on psychological well-being and educational outcomes. Research indicated that adults and older adults experienced a decrease in anxiety levels and an enhancement in positive emotional states due to VR interventions. Similarly, another study emphasized the use of VR technology in treating mental health issues among adolescents, focusing on the creation of scenes with auditory, visual and tactile fidelity to alleviate anxiety and stress. These investigations underscore the potential of VR interventions to foster psychological well-being across various age demographics, highlighting the need for continued research to improve the therapeutic impact of VR technology within educational settings. Consistent empirical studies have clearly shown the exceptional effectiveness and diverse advantages of VR interventions in promoting psychological well-being to extraordinary degrees while also enhancing educational experiences [16]. The significant progress made in research has revealed the vast potential and transformative capabilities inherent in VR interventions. A prime example of this is groundbreaking research conducted by Montana et al. The remarkable reduction in anxiety levels and the extraordinary enhancement of positive emotional states achieved through innovative

and pioneering VR interventions has been clearly highlighted. Equally significant, thorough research has shown that when VR interventions are skillfully implemented, they can effectively improve adherence, motivation and steadfast participation in exercise and physical activity programs for the determined adult population facing physical disabilities that would usually impose unyielding constraints. This crucial insight introduces an astonishingly revolutionary shift in the realm of physical rehabilitation and recovery, moving beyond conventional approaches and empowering individuals to overcome challenges that once appeared impossible. Furthermore, strong and consistent scientific evidence confirms that VR-based interventions effectively match the success of traditional methods in addressing a wide range of mental disorders, often yielding swift and impressive positive results in a shorter time frame compared to conventional therapeutic practices [17]. This groundbreaking revelation represents a significant shift in perspective, marking the dawn of a new era in the equitable treatment of various mental health conditions. It liberates individuals from the confines of traditional therapy, enabling them to reclaim their optimal mental and emotional well-being with remarkable speed, alleviating their suffering and revealing innovative routes to healing and recovery. Additionally, a scholarly study by Frewen et al. explores and clarifies the vast potential found within the remarkable domain of VR technology, particularly its considerable ability to enhance mental health and promote widespread well-being among those it touches. This is especially relevant in the context of exposure therapy designed to confront and mitigate trauma and the debilitating effects associated with stress-related disorders. This pivotal research not only calls upon mental health professionals, practitioners and researchers to thoughtfully incorporate VR technologies and methods into their therapeutic practices but also highlights the undeniable and transformative possibilities of VR-assisted treatment approaches, which could fundamentally change the therapeutic landscape and offer renewed hope to those trapped in pain and trauma [17]. Although existing studies have largely concentrated on the compelling effectiveness and practical benefits of VR exposure therapy, it is crucial for upcoming research to thoroughly examine the extraordinary results and synergistic effects that could arise from integrating VR technology and methods into other structured psychological interventions within the esteemed and intellectually enriching settings of educational institutions. This approach would allow for a well-rounded and comprehensive understanding of the unexplored potential and extensive implications of VR-assisted psychological interventions, revitalizing the field and opening up new avenues that could transform and enhance the psychological well-being and educational experiences of numerous individuals, thus empowering them to realize their full potential and create a brighter, more fulfilling future [18].

7 Conclusion

To sum up, the emerging field of research surrounding virtual reality (VR) and its impact on promoting psychological well-being within educational settings holds significant promise. Evidence suggests that incorporating VR technology into both mental health treatment and educational frameworks yields positive results, particularly highlighted by notable differences in mental health among adolescents across various genders, ages, family backgrounds and urban versus rural environments. Additionally, the immersive nature of VR technology has the capacity to deeply affect and shape the user's mental landscape, thereby enhancing their ability to adjust psychologically and alleviating mental stress. Although the existing peer-reviewed literature in clinical psychology regarding VR's applications for mental health is still developing, the potential for VR technology to foster improved mental health and overall well-being in educational contexts is clear.

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Deep Learning Based Analysis of the Key Scheduling Algorithm of AES Cipher



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Abstract This paper presents how the Advanced Encryption Standard (AES) is utilized in the current Information Technology world. AES encrypts private information, giving security when transferring this information to prevent its access by unauthorized parties using very different mediums, like online transactions or data storage devices. The success of security provided in AES lies in the KSA—Key Scheduling Algorithm which generates the keys which used in encrypting the data. Our research embarks on a deep learning approach-based investigation into AES KSA. More specifically, neural network models will be utilized to probe the operational dynamic and characteristics that the AES KSA exhibits. The purpose of the study is to unveil not just the robustness and possible weaknesses of AES KSA but also to utilize patterns which could be identified for such weaknesses. By the training of our neural network with keys datasets, we strive to identify any visible patterns or weaknesses in AES that can be exploited by individuals for malicious purposes. This paper also significantly enhances the value of literature through debate surrounding different countermeasures, much of which enhance the security architecture corresponding to AES.

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Keywords Advance encryption standards (AES) · Deep learning · Neural network · Key scheduling algorithm (KSA) · Data security · Technological progress

1 Introduction

The very development of AES goes to prove the fact that "necessity is the mother of invention." While bordering on the end of the twentieth century, it was clear how essential our data security was. This decade emphasized protecting data more than ever before, due to the huge amount of information that was exchanged across computer networks. The Data Encryption Standard, in use since the 1970s as a staple for the IT industry and different organizations, was considered inadequate against the new cyber threats of the day [1]. 2 To rectify this deficiency, the U.S. National Institute of Standards and Technology (NIST) sponsored a competition in 1997 to develop an encryption procedure that could supplant Data Encryption Standard (DES). The challenge in the global arena brought cryptographers and mathematicians into frantic action to propose new, secure, efficient, and powerful encryption algorithms for scrutiny. Benchmarks for the contest were based on security, efficiency, and adaptability. One such algorithm was Rijndael, proposed by two Belgian cryptographers, Vincent Rijmen and Joan Daemen. It became a winner after rigorous selection, which subjected it to minute testing and analysis. We finally came to know that Rijndael had been declared the standard of AES by NIST in 2001. AES is a 'digital lock' for computer networks, which protects all our electronic information. Just as we lock and unlock doors using keys, AES uses a secret key to encrypt and decrypt information. Now, the selection of the correct key needed to accomplish the task rests in the Key Scheduling Algorithm. This can very simply be explained as a formula that turns the secret key into a number of intricate characters and numbers used by AES in protecting the data [2].

In recent decades, AI has experienced exponential growth across numerous sectors, including big data, the Internet of Things, robotics, banking, finance, healthcare, e-commerce, meteorology, education, facial recognition, information systems, autonomous driving, and data security, among others [3].

While many focus on providing an in-depth analysis of the AES KSA, this paper discusses how Deep Learning could play a new role. Deep learning is one of the modern computation methods that can find hidden patterns or secrets in data fairly obscure to humans. In this research, we make use of Deep Learning to analyze the security effectiveness of the AES KSA and find any pattern-based vulnerabilities that may be exposed by such technology [3, 4].

2 AES Cipher

AES

AES stands for Advanced Encryption Standard Cipher and is a method used in protecting digital data. Just like a digital lock, it protects or secures our information when moved across the internet or stored in electronic devices. In this process, what we usually write as a message to be conveyed is called plaintext, and that is what gets converted into something like a secret code. There is a special key needed to read this message, and only those who are to read our message should have this key [5]. AES is, therefore, very crucial in enabling safety online. It difficulties for all practical purposes, makes impossible the breaking of a code by entities that shouldn't have access to the information, so they can read the private data. This ranges from passwords to personal messages—meant only to be seen by those allowed. This essentially is what AES does: it gives us a strong way to encrypt and hence protect our information [2].

AES Keys and Rounds

The number of steps, or rounds, in the AES (Advanced Encryption Standard) encryption and decryption process depends on the key size which is being used in this encryption process. Generally, a larger key provides more security, as it increases the difficulty for unauthorized parties to crack the encryption. AES encryption and decryption are categorized into three types based on the key size and the number of rounds required. Following is description and its use case information about each type categories which used in the modern internet world for encryption and decryption of data which is being transferring over internet.

AES encryption and decryption can be categorized into three types, each based on the size of the key and the corresponding number of rounds needed:

1. **128-Bit Key—10 Rounds**: This version uses keys that are 128 bits in length, requiring a total of 10 rounds to complete the encryption or decryption process.
2. **192-Bit Key—12 Rounds**: In this case, the keys are 192 bits long, and the process involves 12 rounds.
3. **256-Bit Key—14 Rounds**: The most secure option uses 256-bit keys, with the process spanning 14 rounds.

The choice among these options depends on the specific needs and desired level of security.

3 Encryption Process in AES

Encryption Decryption Process

The AES (Advanced Encryption Standard) encryption process involves multiple steps, each designed to enhance the security of the data being encrypted. Here, we'll

walk through the AES encryption process for a 128-bit key, which involves 10 rounds. Following is diagram which shows its encryption process (Fig. 1).

To simplify and clarify, let's break down the AES encryption process and the key scheduling algorithm step by step:

AES Encryption Process

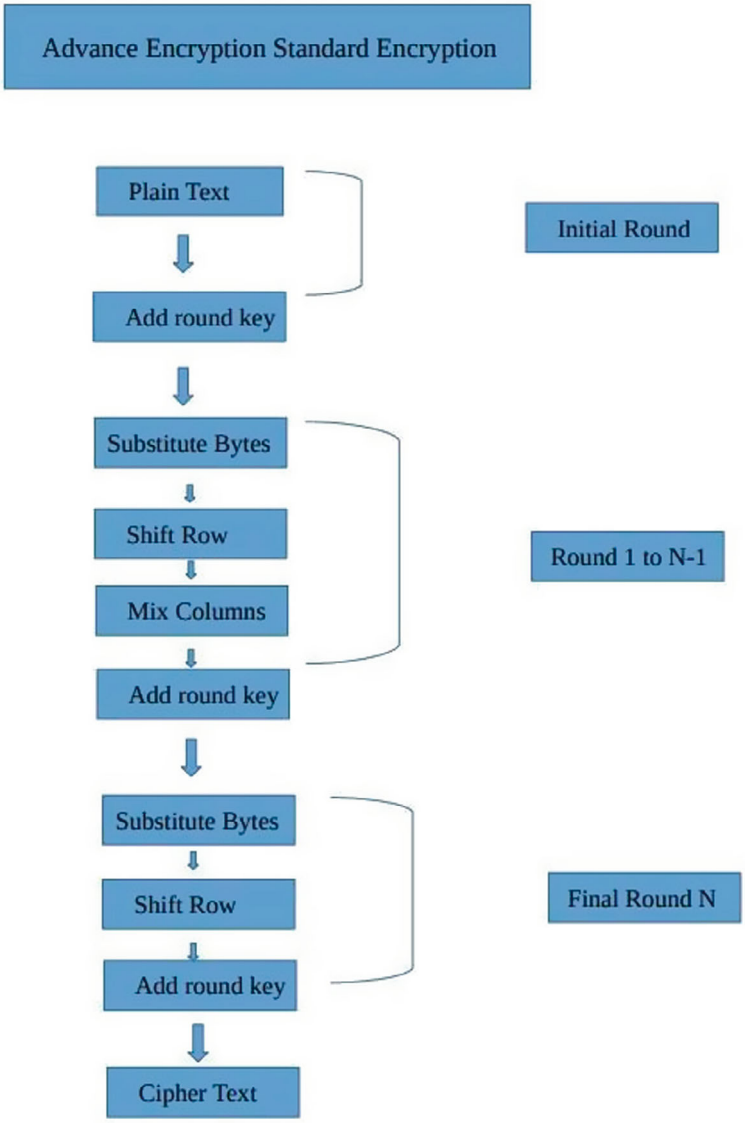


Fig. 1 AES encryption process

A. Initial Steps and Rounds

Initial Round

Above figure shows how AES Encryption works and how we goes from initial round to final round in order to encrypt our data using AES 128 Bit algorithm. Now we will discusses it in much more details that what particular round do in the encryption process.

Sub-Bytes (Substitution)

In this step, each byte of the data is replaced with a corresponding byte from the AES substitution box (S-box). The S-box is a predefined table used in all AES encryptions, ensuring consistency and security. This substitution step is crucial for introducing non-linearity into the encryption process.

Shift Rows

The arrangement of bytes within each row of the data matrix is shuffled based on a predefined pattern.

Mix Columns

This involves blending the columns of the data matrix through mathematical operations to further obscure the data.

Add Round Key

Here, the data is combined with a round key using a bitwise operation known as XOR (exclusive OR). This step mixes the data with the key, providing another layer of security. Each round uses a different key derived from the original encryption key, ensuring that the encryption process is both complex and secure.

Final Round

Similar to previous rounds but excludes the Mix Columns step. It includes the Sub Bytes, Shift Rows, and Add Round Key steps to finalize the encryption.

After completing all rounds, the plaintext is fully transformed into ciphertext, which is then ready for secure transmission. To access the original data, the recipient reverses this process.

Decryption

The decryption process in AES essentially reverses the steps of encryption. The ciphertext is transformed back into plaintext through a series of rounds that mirror the encryption steps. By following the inverse operations of Sub-Bytes, Shift Rows, Mix Columns, and Add Round Key, the original data can be accurately and securely retrieved [2].

B. Key Scheduling Algorithm for AES-128 Bits

Understanding how keys are generated in the AES (Advanced Encryption Standard) encryption process is important for appreciating its security. Here is a step-by-step breakdown of the key generation of AES which also known as key expansion in AES KSA, for a 128-bit key.

Key Generation Steps

Key Expansion

Start with the original 128-bit key.
Prepare an array for storing round keys.
The first round key is derived directly from the initial 128-bit key.

Round Constants

Prepare a list of 10 round constants (Rcon), essential for generating the round keys in the AES-128 variant.

Key Expansion Loop

This loop runs through multiple iterations (10 for AES-128) to expand the key.

Word Transformation

Select the last 4 bytes (32 bits) from the current round key.
Apply transformations including rotation, substitution using the S-box, and XOR operations with the round constant and parts of the previous round key.

Expand Key

The newly formed 32-bit word is XORed with another 32-bit segment from earlier in the key sequence to create a new part of the round key.

Store Round Key

The new 128-bit round key generated from these operations is added to the array of round keys.

Repeat

Continue this process for a total of 10 iterations to create all necessary round keys for the encryption process.

This detailed procedure ensures the generation of secure keys for AES-128 bit encryption, contributing to the overall strength and security of the encryption method.

4 Deep Learning

The role of AI and Deep Learning in today's fast-changing technological world is simply profound. Deep Learning can be regarded as the bedrock of AI, motivated by the need to make computers learn on their own, just like humans teaching and learning. This as a technological progress it does similarly to how humans are capable of recognizing patterns after bombardments of stimuli, only this time on a very large scale of data [6].

Deep learning runs on vast volumes of data, usually in arrays and matrices, to train models. These datasets can include anything from images like cats and dogs to other forms of data. What really challenges Deep Learning models is the ability of self-detection of complex patterns in this data. Actual flow of Deep Learning Managed Artificial neural networks doing a similar function as virtual brains. It is in these networks that there are layers formed of interconnected nodes, all of which, in some sophisticated decision-making system, scrutinize and interpret the data [7, 8].

Deep learning (DL) is a widely used approach within machine learning (ML), that operates within a subset of the broader fields of ML and artificial intelligence (AI), and can be viewed as an AI function that simulates the way the human brain processes information [9].

These models achieve effectiveness in identifying patterns and generating accurate results from being trained on large amounts of datasets and employing multiple techniques. Applications of Deep Learning apply across domains in areas such as voice and face recognition in photos, making a huge difference to the technological limitation. This technology is an intrinsic part of Artificial Intelligence and brings digital optimizing intelligence and efficiency into our lives.

Neural Network

Neural networks, as their name suggests, mimic the structure and function of the human brain. These networks consist of interconnected nodes, similar to the neurons in our brains, which allow them to process information and learn from it. The nodes work together to analyze data, recognize patterns, and make decisions [9].

For example, neural networks can interpret spoken language, identify objects in images, or predict trends based on input data. They are used in a wide range of tasks that involve complex data analysis and have become essential to machine learning and artificial intelligence. Much like our brains, neural networks adapt and learn from the data provided to them. This learning process enables them to perform tasks in a manner similar to human decision-making in various scenarios. Additionally, neural networks can be trained to improve their performance, making them powerful tools for a multitude of applications [10, 11].

Deep learning, as a branch of artificial intelligence, is considered one of the basic pillars of the Fourth Industrial Revolution, as it contributes to improving industries, including computer networks and data transfer with high accuracy [12].

Following is a simple diagram of neural network structure which includes an input layer with 6 neurons, two hidden layers with 4 and 2 neurons respectively, and an

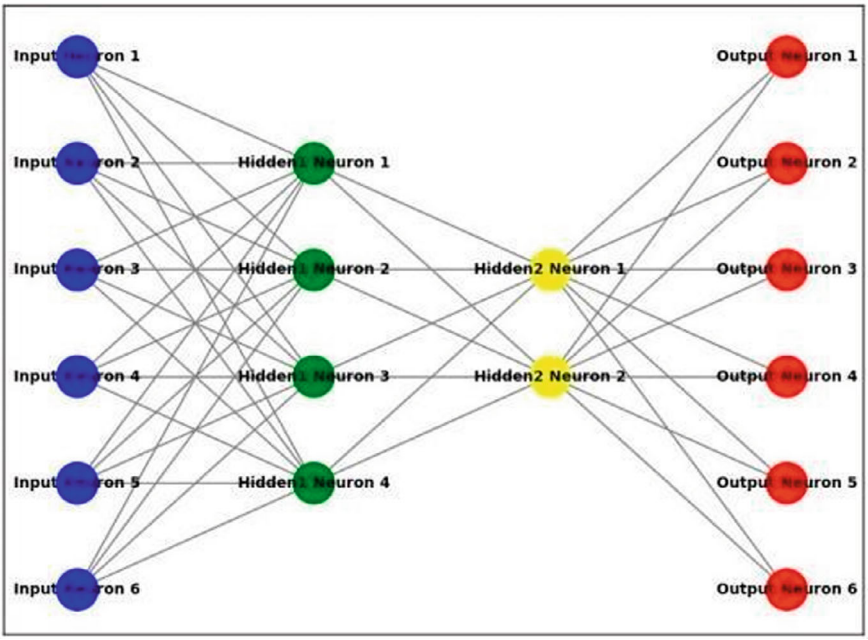


Fig. 2 Processing structure of AES cipher

output layer with 6 neurons. The number of layers and neurons can be adjusted based 9 on specific requirements and objectives, allowing for flexibility in their design and application (Fig. 2).

In everyday use, neural networks enhance various technologies we rely on. They power voice assistants that understand and respond to spoken commands, help social media platforms recognize and tag faces in photos, and enable self-driving cars to navigate safely by identifying obstacles and making split-second decisions. Neural networks also play a crucial role in financial services by analyzing market trends to make investment predictions and in healthcare by assisting in the diagnosis of diseases through the analysis of medical images.

In our case of AES Key Scheduling Algorithm we are also using Neural Network In order to process our large amount of initial key data and then we are trying to find any hidden pattern in these keys.

Analysis of AES Keys

Our research paper aims to enhance the security analysis of the Advanced Encryption Standard (AES) cipher by using Deep Learning, specifically Sequential Neural Networks (SNN). Although AES is considered one of the most secure encryption algorithms, it may still be vulnerable to attacks leveraging deep learning techniques. One 10 potential weakness lies in the key scheduling process, which generates round

keys from the initial secret key. To address this, we propose using SNNs to analyze and possibly strengthen this critical component of AES [7, 13].

Our approach involved training our model with 15,000 samples of AES Initial Round keys and their corresponding 10th Round keys. We then tested the trained Deep Learning model using 500 Initial Round Keys, aiming to predict their corresponding 10th Round keys. Here is an overview of our Deep Learning implementation.

1. **Input Layer**: Comprising 128-bit neurons, reflecting the length of the AES keys.
2. **Hidden Layers**: Consisting of 5 layers with varying neuron counts: 64, 32, 16, 8, and 4 bits respectively.
3. **Output Layer**: Activated using the sigmoid function, with 128-bit neurons to accommodate the 128-bit final Round key.

By following these steps, we conducted tests to gain insights into the security and vulnerabilities of the AES Key Scheduling Algorithm (KSA) using our Deep Learning model. This approach allows us to delve deeper into the intricacies of AES and potentially fortify its defenses against emerging threats. In essence, our research seeks to leverage the capabilities of Sequential Neural Networks to scrutinize and enhance the AES encryption process.

Through rigorous training and testing, we aim to identify any weaknesses in the key scheduling process and propose methods to mitigate these vulnerabilities. The ultimate goal is to improve the robustness of AES against sophisticated attacks, ensuring stronger encryption and better protection of sensitive data [14–17].

5 Results

After the huge amount of data process and training and testing our model against AES Key Scheduling Algorithm Security and its robustness following is our result table which shows the matching percentage of corresponding bit in key from initial key (Table 1).

The accuracy table shows the percentage of correctly predicted bits using our trained model. Some bits have accuracy rates above 50%, while others are below this mark. On average, the accuracy is about 50%, meaning our model correctly predicts around half of the bits in the 10th round key, which consists of 128 binary digits (0s and 1s).

From these results, we conclude that each bit has a predictability of 1/2, indicating an equal chance of being 0 or 1 in any given position. This analysis suggests that the AES Key Scheduling Algorithm (KSA) is robust against deep learning cryptanalysis based on our methodology. The equal likelihood of predicting each bit demonstrates that the KSA maintains its security integrity, resisting attempts by our deep learning model to uncover the key patterns. Our finding highlights the strong security of the AES Key Scheduling Algorithm. Even with advanced deep learning techniques, the KSA keeps each bit unpredictable and secure. This resilience reaffirms that AES is a reliable encryption standard.

Table 1 Result of our trained deep learning model

Bit position (1–32)	Matching % (1–32)	Bit position (33–64)	Matching % (33–64)	Bit position (65–96)	Matching % (65–96)	Bit position (97–128)	Matching % (97–128)
1	48.5	33	48.5	65	49.5	97	50
2	49.5	34	47.5	66	51.5	98	44.5
3	45.5	35	47	67	45	99	61
4	48.5	36	48.5	68	46	100	48.5
5	51	37	47.5	69	46	101	54
6	51.5	38	47	70	50.5	102	50
7	47	39	51	71	50	103	53.5
8	46	40	53.5	72	53.5	104	52
9	51.5	41	47	73	49.5	105	50
10	46.5	42	51.5	74	46.5	106	52
11	46.5	43	48.5	75	50.5	107	51.5
12	45	44	45.5	76	45	108	49
13	50	45	49	77	47.5	109	56
14	50.5	46	55.5	78	60.5	110	47.5
15	53	47	42	79	52	111	48.5
16	46	48	46	80	44	112	47.5
17	46	49	53	81	50	113	49
18	51.5	50	54	82	42	114	49
19	54	51	49.5	83	53	115	52.5
20	54	52	48.5	84	55	116	47
21	51.5	53	56.5	85	45.5	117	55
22	50.5	54	44	86	52	118	48.5
23	50.5	55	55.5	87	45.5	119	48
24	50	56	47	88	49.5	120	47.5
25	45	57	49.5	89	54.5	121	48.5
26	50.5	58	55.5	90	49	122	54.5
27	45	59	47.5	91	56	123	47.5
28	51	60	50.5	92	53.5	124	50.5
29	43	61	51.5	93	53	125	50
30	49	62	49	94	49	126	48.5
31	50	63	52	95	53.5	127	51
32	44	64	51.5	96	46.5	128	54

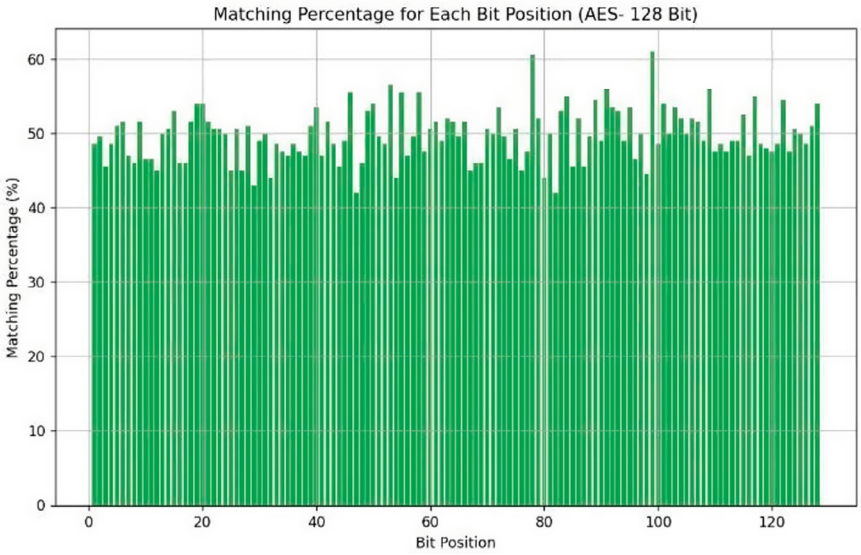


Fig. 3 Bar chart deep learning graph

Following is Bar chart representation of the gained output which shows bit position of 128 bit of AES Cipher to X axis and Matching percentage to Y Axis range from 0 to 100% (Fig. 3).

In the bar chart graph, we can see most of the bits showing range from 45 to 60% which is approximate to 50% and also we can easily understand sometimes our results goes with more accuracy more than 60%.

Another graphical representation is wave graph of our gained result. In the following graph its showing variance of our result bits matching with previous one and its point the position and percentage of corresponding bit (Fig. 4).

In order to Understand some more clear way with respect to frequency of results lets see following is histogram which have matching percentage on X axis and Frequency of specific results on y axis (Fig. 5).

In above histogram we can see maximum frequency is of matching percentage of 50% which shows most of the bits we can only predict with half accuracy and there are very less number of bits which we can predict more than 60%.

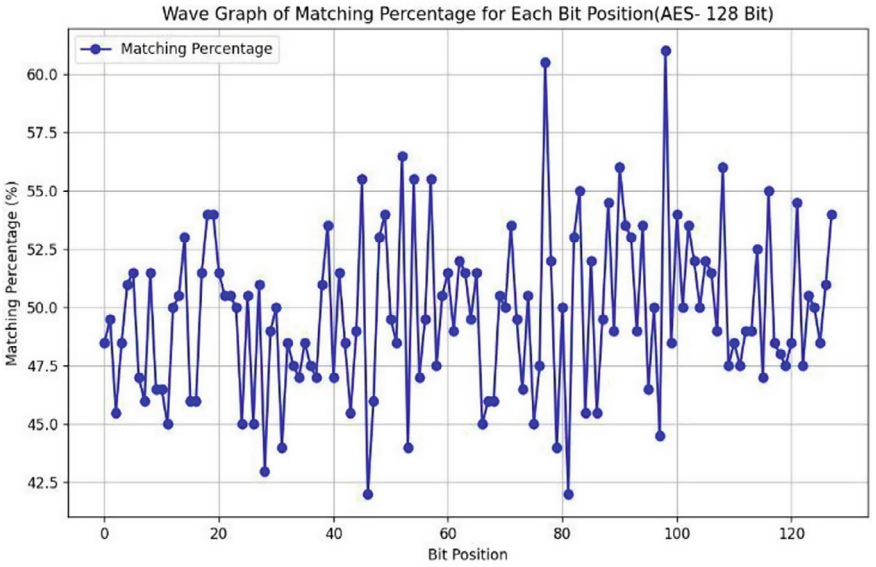


Fig. 4 Wave graph deep learning model results

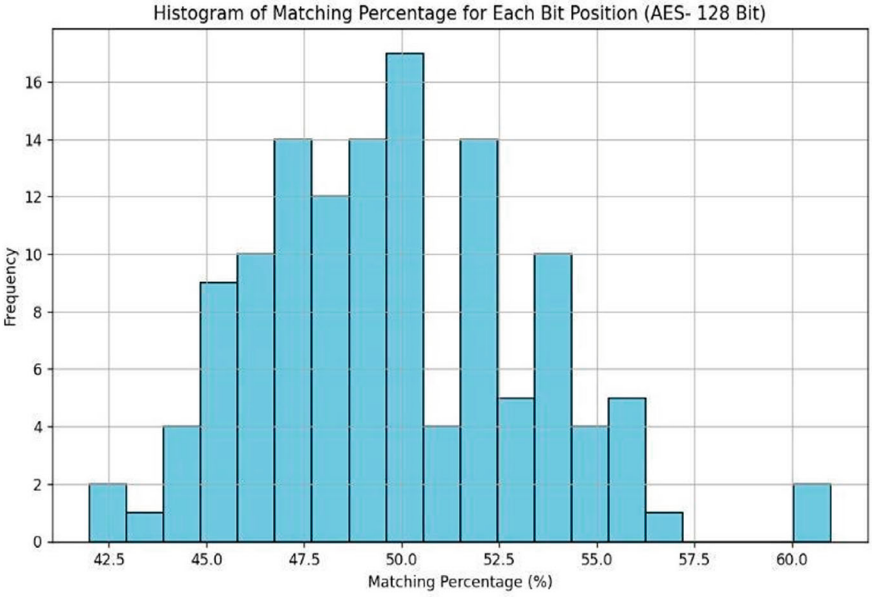


Fig. 5 Histogram of deep learning model results

6 Conclusion

In summary, in this research paper, we assessed security using the approach of deep learning over AES. We found one of the most important modules of AES to be the Key Scheduling Algorithm (KSA), which was critical for improvement. We used our deep learning model to make an in-depth investigation for the existence of patterns and vulnerabilities within AES KSA. The results showed that we could guess with some accuracy about half the bits of the 10th round key.

Thus, this result proves that although the AES KSA demonstrates a strong resilience to Deep Learning analysis forms, there could be many areas for improvement. Our results show the general security of AES and further shed light on how cryptographic systems can be improved to resist AI-based attacks. This study, therefore, ideally helps in improving data security and privacy by adding to existing efforts in the process.

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Legal Responsibility of Service Providers in Cybercrime: A Legal Analysis and Recommendations for Improving Legislation and Mechanisms



Omar Al Makhzoumi and Abeer Zohair Said Saada

Abstract This paper looks at the criminal accountability of service providers within the sphere of cybercrime. The following pages will discuss how national and international laws determine and allocate criminal responsibility regarding service providers, coupled with their role in the dissemination and storage of illegal online content. The findings show that different legal systems have different approaches to assigning responsibility toward service providers. However, they all agree that key factors in determining responsibility are the provider's knowledge of the illegal content and their inaction upon it. Legal cases from various scenarios form part of this study. On this basis, the paper recommends the harmonization of global legislation on service provider liability, improved awareness and protocols for providers, monitoring and oversight mechanisms and clear legal frameworks to support service providers—all towards more effective action on cybercrime and compliance with relevant laws.

Keywords Criminal liability · Service providers · Cybercrime · National legislation · International legislation

1 Introduction

This responsibility to enable information owners, or publishers, to distribute their content online is referred to as the liability of a service provider—or a hosting provider, as it's more commonly known. The legal liability stems from the provider enabling people or organizations to store their data and content on leased space.

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This study explores criminal responsibility for service providers, i.e., hosting providers that have an obligation under law to contribute to information flows online by providing the technical infrastructure and space for such flows. We seek to establish liability for service providers based on general principles, to identify acts or omissions that may ground liability and to identify presumed liability rules that may ground such liability and the conditions that must be met for this to take place. By undertaking this discussion, we aim to enhance our understanding of how different legal frameworks address service providers in the realm of cybercrime, shedding light on their role and legal obligations.

1.1 Study Objectives

- Analyze the criminal liability of service providers according to different laws.
- Assess the role of service providers in cybercrime and how it impacts these crimes.
- Compare national and international laws related to the liability of service providers.
- Examine the applications of criminal liability for service providers in various contexts.

1.2 Methodology

Using a descriptive methodology, this study examines legal texts pertaining to the accountability of service providers under both national and international laws. It assesses existing research and pertinent scholarly works in this field. Additionally, the study investigates court cases involving service provider liability to ascertain the practical application of these laws. Furthermore, a comparative analysis of service provider liability legislation across various countries is conducted to identify commonalities and variations.

2 Criminal Liability of Service Providers (Hosting Providers)

The term “service provider” encompasses both individuals and organizations, whether they are natural or legal entities that have the responsibility of storing applications and records. These stored resources enable users to access them through the internet [1]. Additionally, a service provider is someone who stores and manages data and information on behalf of their clients. They also offer the necessary technical and informational resources to ensure uninterrupted access to this data and information, all in exchange for an agreed-upon fee [2].

According to Egyptian legislation, a service provider is described as any individual or organization that offers users information and communication technology services. This includes those who handle or store information themselves or through a third party for these services or information technology [3]. In contrast, the Jordanian legislation does not specifically define a service provider (hosting provider). However, the Jordanian Electronic Transactions Law No. 85 of 2001, Article 2, defines the "originator" as the person who creates or sends an information message, either personally or through an agent, before it is received and stored by the recipient. The "recipient" is defined as the intended recipient of the information message. Additionally, the Jordanian Consumer Protection Law of 2006, Article 2, defines the "provider" as the manufacturer, importer, seller, or any other party involved in the production and distribution of goods, or the service provider. The "final provider" is defined as the seller of goods directly to the consumer or the service provider directly to the consumer.

According to Article 6(2) of the French Law on Confidence in the Digital Economy No. 575-2004, a hosting provider is described as an individual or entity, whether compensated or not, that retains and offers users access to various forms of data, including signals, texts, images, sounds and messages [4].

The European Directive No. 31-2000, issued on June 8, 2000, contains provisions in Articles 14–15 that lay out the responsibilities and requirements for hosting providers. According to these articles, hosting providers can be held liable if they have knowledge of illegal content on their websites or if the illegal activity is clearly evident and they have the ability to control the content after being informed of it. However, Article 15 specifically prohibits EU member states from imposing a broad obligation on hosting providers to monitor website content or investigate the circumstances surrounding unlawful publications [4].

The obligations and responsibilities of hosting providers have been emphasized in a legal case in the United States, specifically Viacom International Inc. et al. v. YouTube, where legal scholars have analyzed YouTube's role as a hosting provider [2]. Similarly, a ruling by the Paris District Court on April 13, 2010, enforced a monetary fine and the removal of an image, deeming the comments defamatory and a violation of the plaintiff's rights, citing Article 6(4) of the Law on Confidence in the Digital Economy (LCEN) [4].

After carefully analyzing the information provided, our deduction is that a service provider refers to an individual or entity, either natural or legal that offers web hosting services on their servers in exchange for compensation, essentially assuming the role of a network landlord.

3 Liability of Hosting Providers According to General Principles

The liability of the hosting provider is derived from the fact that they act as a client to the author of information or content. Their main responsibility lies in the storage and management of the information and content that is accessible to the public. The hosting provider's role is primarily focused on publishing, while the oversight of visual and auditory publishing services falls under the purview of pre-publication supervision. It is important to note that the hosting provider does not interfere or modify the content or information before it is published on the internet. As a result, the liability of the hosting provider may arise as a secondary consequence or due to attempts to conceal certain aspects, which we will elaborate on in the following sections.

3.1 Hosting Provider as an Accessory in the Crime

When a service provider offers space to a publisher of illegal information, they can be held liable as an accomplice to the crime. This is because their technical role involves facilitating the dissemination of such content. However, it is necessary to establish whether the hosting provider had knowledge of the unlawful information on their platform, either at the time of publication or after discovering its illegality. We can consider two possible situations in this regard.

Absence of Awareness: In the event that the hosting provider had no knowledge of the content being published, they cannot be deemed negligent or at fault for not taking necessary precautions. Their accountability cannot be established if it can be proven that they were unaware of the illicit nature of the content [5].

The determination of criminal liability hinges on whether the crime in question is a one-time occurrence or an ongoing act. In cases where unlawful messages or content are published instantaneously, the hosting provider must have had prior knowledge of the crime or simultaneous knowledge of its commission in order to be held criminally responsible. However, if the crime is ongoing, the hosting provider can be deemed an accomplice to the crime simply by having knowledge of its existence at any point in time [6].

In order to escape legal responsibility, a service provider must provide evidence to the contrary, demonstrating that they were unaware of the illegal nature of the electronic content. To be held accountable as an accomplice to the dissemination of unlawful information, the service provider must provide proof of their active participation in specific acts, such as incitement, agreement, or assistance. The types of involvement considered in this context are assistance, which entails taking affirmative steps that contribute to the criminal activity. This participation must be genuine and not assumed, requiring evidence that the hosting provider became aware of the

illegal nature of the information at a later time, subsequent to the discovery of the unlawful message [7].

If a service provider stores pornographic activities and is penalized in accordance with the aforementioned provision, they are deemed a primary participant. However, if they aid others by offering storage for illicit content, they are regarded as accomplices to the offense.

3.2 Liability of the Service Provider (Hosting Provider) for Concealment Offenses

The criminal liability of the hosting provider for committing a concealment offense requires that the concealed items are obtained from a crime. The criminal responsibility for concealment by the hosting provider can be distinguished in two scenarios [8]:

- **Storage on Computer Memory**: In the event that the hosting provider retains the content or information within computer storage, their culpability for concealing said content cannot be proven. In such circumstances, the obligation to disclose does not arise, as the content exists solely in a non-physical state that cannot be the target of criminal activity.
- **Storage on a Hard Drive**: The hosting provider can potentially face criminal liability if they store information on a physical hard drive, as this involves a tangible item that can be involved in a crime.

Accordingly, for the service provider to be held liable under the provisions of concealment offenses, two conditions must be met:

- **Storage of Unlawful Data**: The provider must store unlawful data on their own computer memory.
- **Knowledge of Illegality**: The provider must be aware of the unlawfulness of the data either at the time of hosting or after its dissemination and must have failed to cease its dissemination, thereby contributing to its spread.

4 Liability of the Hosting Provider Based on Presumed Liability Rules

Presumed liability is applicable when the content or information has been documented before being made public. This implies that the content or information should have been accessible for a specific duration, rather than being instantly generated and disseminated. The purpose of this principle is to safeguard providers of live broadcasts, as web pages possess the feature of pre-recording information. Consequently, the necessity for pre-registration prior to public availability is enforced. However,

this criterion varies for news groups, which do not depend on broadcasting. Hence, supervision of live broadcasting is imperative [9].

In the realm of presumed liability, there is a sequential involvement of the author, publisher and producer. However, the hosting provider's responsibility is not as clear-cut since these roles do not directly apply to them. The hosting provider can assume different roles, such as providing guidance or technical support, or even taking on the role of an online publisher.

In the realm of criminal liability, French courts have determined that internet service providers can be held criminally responsible if they are found to be involved in or participating in a criminal act. A significant legal precedent was set on July 10, 1997, when the Paris Court of First Instance ruled that an internet service provider's role in distributing unlawful content could be considered as involvement in the crime, resulting in their conviction alongside the main perpetrator [10].

On May 28, 1998, the Munich District Court made a ruling that found an internet service provider guilty of being an accomplice in the dissemination of child pornography on web pages. In accordance with Article 31 of the Anti-Cybercrime Law in Egypt, it is stated that any service provider who violates the provisions outlined in item (2) of the first paragraph of Article (2) shall face penalties including imprisonment for a minimum of one year and a fine ranging from five thousand to twenty thousand pounds. The fine will increase based on the number of victims utilizing the service [2, 11–13].

According to Article 83 of the Penal Code No. 16 of 1960 in Jordan, individuals who knowingly hide belongings that have been unlawfully acquired, stolen, or obtained through criminal acts, with the exception of cases outlined in paragraph (5) of Article (80) of this law, may face a maximum prison sentence of two years and a fine not exceeding fifty dinars [3].

The penalties outlined in Article 75 of the Jordanian Communications Law No. 13 of 1995 apply to individuals involved in or aiding the provision of a communications service that goes against public order or morals [2].

Furthermore, in Article 8, Paragraph (b) of the Cybercrimes Law, the Jordanian legislator employed the term "storage" to describe the intentional utilization of an information system or network for various activities such as preparing, processing, displaying, printing, publishing, or promoting pornographic content with the intention of influencing individuals under the age of eighteen or those who have mental or psychological impairments, or to incite and encourage them to engage in criminal behavior [14–16]. The prescribed penalties for such actions include a minimum prison sentence of two years and a fine ranging from one thousand dinars to five thousand dinars [5].

5 Conditions for Criminal Liability of Service Providers (Host Providers)

For the criminal liability of service providers to arise, the following conditions must be met: actual knowledge of the illegal content, failure to act and we will address them in turn:

5.1 Actual Knowledge of the Illegal Content

The obligation of service providers typically does not come into play if they have no knowledge of the unlawful nature of the hosted content or the ambiguous circumstances surrounding its illegality. "Actual knowledge" in this context pertains to being conscious of the content and its adherence to the laws in place. This requirement is critical in determining the service provider's intention regarding criminal activity [17].

The mental state of a service provider concerning the information they store and the legal outcomes of their actions forms actual knowledge of illegality. This knowledge begets the criminal culpability that results from these activities or from the foresight of potential effects being entailed [18].

The definition of this term also covers the cognitive state of the intermediary, which includes their genuine understanding of the factual components that make up their actions and also their awareness of the criminal activities as well as the possible outcomes, or hindsight [19].

To determine the scope of knowledge about illegality for hosting services, it is based on:

- **Nature of the Facts Known to Hosting Providers**: It is crucial for hosting providers to have knowledge of illicit activities and to proactively implement measures to prevent such activities. They must possess an understanding of the potential outcomes of their inaction and be equipped to take appropriate steps. If the service provider lacks awareness of these facts or believes that they are unable to effectively mitigate harm or illegal activities, their intention to engage in criminal behavior is nullified and they are not held accountable for any criminal responsibility [20].
- **Limits of the Facts Required for Hosting Providers to Know**: To establish criminal activity and the resulting harm, as well as anticipate criminal outcomes, the provider must possess knowledge of the tangible components involved. Merely being aware of these facts is enough. Furthermore, they must be familiar with the time of the offense, as well as the characteristics of both the perpetrator and the victim, as mandated by law [21].

The criminal liability of a service provider depends on whether they knew or had to know that the information to be transmitted was illegal or criminal. And if they

do, then it must be proved whether the provider immediately removed or blocked access to the illegal content after getting such notice. This includes where they were supposed to report to law enforcement about the illegal nature of such content or stop its further circulation after getting knowledge [22–24].

Under the European directive issued on June 8, 2000, which pertains to e-commerce, member states are required to adhere to a framework that upholds the non-liability of service providers, given certain conditions. One such condition is the provider's actual knowledge of the illicit nature of the content they are hosting. If the service provider is aware of or can easily discover the illegal nature of the material, they may face criminal liability for negligence. According to Article 14(1) of the European directive, service providers are not held accountable for stored information if they are unaware of its illegal nature or cannot reasonably be expected to be aware of it [25].

5.2 Failure to Act

1. **Failure to Notify** Informing service providers about criminal activities and their online distribution is a lawful method of notifying them about illicit activities that are being hosted or made available through their services. If service providers fail to report illegal content after becoming aware of its existence, they can be held criminally responsible for disseminating content that is a product of a crime [26].
2. **Failure to Cease Broadcasting** If the service provider fails to discontinue broadcasting, they are obligated to take action in halting the unlawful material as soon as they become aware of its presence, whether this awareness is a result of their own investigation or notification from a third party. Failure to remove or restrict access to the illicit content will result in criminal liability for disseminating criminal material [27]. Thus, the service provider is required to [28]:

- Remove or block access to illegal content immediately after detecting its illegality, otherwise they will be liable for publishing the content resulting from the crime [29–31].
- Implement measures to block or disable access to illegal content, making it inaccessible to Internet users [32–34].
- Provide technical resources and tools to help other service providers identify and report illegal content [35–38].

In accordance with the European E-Commerce Directive and the French Digital Economy Trust Law, a host provider can be held criminally accountable if they possess actual knowledge of illegal or criminal content being transmitted through their technical systems [39–43]. However, this liability only applies if the illegal activity is not readily apparent and the provider has the necessary technical means to control the transmitted information. To avoid liability, the provider must promptly cease broadcasting the illegal content upon discovering its illicit nature or take action

to remove it upon notification from relevant authorities. It is important to note that the provider's liability will be absolved if they were not aware of the content's illegality. Additionally, network service providers are exempt from liability if they lack actual knowledge of the content's illegal nature and upon becoming aware, take appropriate measures to remove or block access to the content. It is crucial that these providers operate as neutral intermediaries without assuming responsibility for the content itself [44].

The commission of information-related crimes through internet sites involves the collective effort of multiple individuals, constituting a form of criminal participation in the realm of information service provision. This type of crime falls under the category of information service crime, characterized by the collaboration of multiple perpetrators in the execution of the offense. This contribution is divided into the following:

Primary Contribution: In cases where service providers are implicated in criminal activities, it is generally a single individual who commits the crime, although there are instances where multiple individuals are involved. The service provider takes on the role of a primary contributor when they actively engage in or instigate others to commit the crime by promoting or facilitating the criminal activity through their hosting services. This entails utilizing lawful methods of incitement and necessitates that each participant possesses the requisite mental state to establish a connection between their actions and the hosting services [23].

Secondary Contribution: Contributing in a secondary capacity entails multiple sources of information collaborating to accomplish the criminal objective without directly carrying out the crime. Mere fulfillment of the physical elements is inadequate; the mental aspects must also be taken into account, revealing the participant's psychological state in relation to their involvement in the criminal conduct. In order for secondary contribution to be established, it is imperative that the individual possesses a conscious understanding of the partner's illicit actions and their consequential impact on the subsequent actions of the primary offender [24].

6 Conclusion

To summarize, this investigation uncovers the intricacies associated with the enforcement of cybercrime laws in relation to the criminal culpability of service providers. The results show that there are huge differences between jurisdictions: this could be prevented if legislation were harmonized or at least if service providers could clearly understand their legal obligations. Improving monitoring and legal aid mechanisms could help improve justice as well as fight cybercrime.

6.1 Findings

The study reached the following conclusions:

Determining the extent of criminal liability for service providers involves considering their awareness of illegal content and their failure to respond appropriately.

Countries have diverse approaches when it comes to the criminal liability of service providers, with some implementing strict laws while others prioritize safeguarding the interests of these providers.

The main factor determining the criminal liability of service providers is their awareness of illegal content and their neglect to take appropriate measures for its removal.

The study showcases a range of judicial instances that illustrate the diverse approaches taken by courts when addressing the issue of liability for service providers in various situations.

6.2 Recommendations

Harmonization of legislation: Standardize service provider liability rules internationally to help fight cross-border cybercrime.

Raising awareness: increasing service providers' awareness of their legal obligations and providing training on managing illegal content.

Develop monitoring mechanisms: Create effective monitoring and surveillance mechanisms to ensure faster and more effective removal of illegal content.

Provide clear legal support: Offer clear legal guidance to service providers on how to comply with the law and avoid criminal liability.

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Anomaly Detection Technique for Network Intrusion Detection Using Ensemble Algorithm



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Abstract Network intrusion detection is a key element in securing computer networks against unauthorised access and cyber-attacks. Traditional network intrusion detection systems (NIDS) face challenges in identifying unknown sophisticated threats due to their reliance on signature-based detection. In contrast, anomaly-based automated detection shows significant superiority. Machine learning approaches show promise in identifying unknown malicious attacks. This research presents an innovative ensemble-based machine learning technique for network intrusion detection, using the CICIDS 2017 dataset. Leveraging technological progress, and using several ensemble strategies, such as Random Forest, Adaboost, Bagging, Bernoulli Naive Bayes, Gaussian Naive Bayes, KNeighbors classifier, Decision Tree, and Multinomial Naive Bayes, we evaluate the performance of the proposed approach. Correlation analysis is employed to select relevant features for network intrusion detection. Our research, utilising various ensemble methods, reveals that the Random Forest technique consistently outperforms existing methods, achieving accuracy and False Positive Rate (FPR) levels typically exceeding 99.9%. This innovative strategy, incorporating robust evaluation metrics, emerges as a valuable tool for fortifying computer systems and networks against emerging cyber threats.

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1 Introduction

In the rapidly evolving cybersecurity landscape, the relentless advancement of cyber threats underscores the imperative for innovative and robust intrusion detection mechanisms [1]. The perpetual cat-and-mouse game between security measures and malicious actors necessitates a continuous evolution of defines strategies [2, 3]. Within this context, safeguarding network infrastructures from unauthorized access and sophisticated attacks becomes an increasingly intricate challenge.

Traditional intrusion detection systems, predominantly reliant on signature-based approaches, exhibit notable efficacy against known threats but face inherent limitations in addressing the ever-expanding spectrum of unknown and sophisticated attacks [4]. The motivation driving this research is rooted in the urgent need to fortify intrusion detection systems against these dynamic challenges. The inadequacies of conventional methods highlight the necessity to explore and implement advanced techniques capable of effectively identifying and mitigating both known and emerging intrusions [5, 6].

In response to these challenges, anomaly-based techniques have emerged as a proactive strategy [7]. By focusing on the detection of deviations from established norms, anomaly- based approaches provide a promising avenue for enhancing the adaptability and efficacy of intrusion detection systems. This research seeks to harness the strengths of anomaly-based methodologies by integrating them with ensemble algorithms, thereby creating a comprehensive and resilient defense mechanism against a broad spectrum of cyber threats.

2 Motivation

The motivation behind this research is deeply rooted in the urgency to fortify intrusion detection systems against the dynamic and ever-growing threat landscape. Recognizing the inherent limitations of conventional methods in dealing with the sophistication and diversity of contemporary cyber threats, there is a compelling need to explore advanced techniques that can effectively identify and mitigate both known and unknown intrusions [8]. This research aims to contribute to the overarching goal of creating a cybersecurity posture that is not only responsive but also proactive in countering emerging threats.

3 Objectives

The primary objectives of this research are twofold. Firstly, it aims to assess the effectiveness of anomaly-based detection methodologies when integrated with ensemble algorithms for network intrusion detection. Secondly, it seeks to provide valuable insights into the selection and integration of these techniques to bolster the robustness of intrusion detection systems. By leveraging the rich and diverse CICIDS2017 dataset, the research endeavors to benchmark and enhance the performance of intrusion detection systems across various network contexts. Through a meticulous exploration of various machine learning algorithms within an ensemble framework, the research strives to offer practical solutions that advance the current state of intrusion detection capabilities, particularly in the face of the constantly evolving cyber threat landscape.

4 Related Works

A. dependable hybrid machine learning model for network intrusion detection

This research introduces a novel hybrid machine learning model for network intrusion detection, addressing the need for improved accuracy and dependability in current Network Intrusion Detection Systems (NIDSs) [9]. Combining machine learning and deep learning, the proposed method employs SMOTE for data balancing and XGBoost for feature selection during efficient pre-processing. Extensive experiments on KDDCUP'99 and CIC-MalMem-2022 datasets demonstrate outstanding accuracy (99.99% and 100%, respectively) without overfitting or Type-1 and Type-2 issues. Performance analysis, including various metrics and cross-validation, showcases the superiority of the proposed features over others. This research contributes a dependable solution for network intrusion detection, amalgamating data balancing and feature selection in a hybrid model for enhanced accuracy and reliability [10].

B. Anomaly Based Network Intrusion Detection Using Ensemble Machine Learning Technique

In this paper, an ensemble learning model is proposed for anomaly-based network intrusion detection, leveraging the strengths of various algorithms. The results demonstrate significant performance improvements over individual classification algorithms, emphasizing the versatility of the ensemble approach. The adaptive accuracy selection rule achieves an 85% accuracy, outperforming alternative high-level techniques [11, 12]]. Notably, the ensemble model surpasses deep neural networks in both efficiency and detection results [13]. The voting algorithm proves superior to other algorithms, aiming to enhance training data quality and optimize feature extraction strategies. This research highlights the potential of ensemble machine learning in network security, providing a robust and efficient approach for intrusion detection. Future work is suggested for automating intruder detection using a rule repository.

C. Anomaly based network intrusion detection for IoT attacks using deep learning technique

This paper introduces an anomaly-based Intrusion Detection System (IDS) for IoT networks using a Deep Learning technique, specifically a filter-based feature selection Deep Neural Network (DNN). The proposed model achieves an 84% accuracy on the UNSW-NB15 dataset, addressing class imbalance with Generative Adversarial Networks (GANs) and obtaining a 91% accuracy. Evaluation metrics including precision, recall, F1 score, and confusion matrices are analysed [14]. The DNN framework, incorporating feature selection and GANs, demonstrates a significant breakthrough in achieving high accuracy, highlighting its efficacy in cyber security for IoT networks. Future applications include adaptation to other datasets with imbalanced class labels.

D. Fuzzy logic-based DDoS attacks and network traffic anomaly detection methods: Classification, overview, and future perspectives

This research explores the escalating cybersecurity challenges, particularly distributed denial of service (DDoS) attacks, emphasizing the vulnerabilities despite existing intrusion detection systems. It introduces a comprehensive survey, categorizing DDoS attacks, and recommends effective defensive strategies, focusing on fuzzy-based detection methods [8]. The findings offer valuable insights for enhancing business sustainability in the industry 4.0 era.

E. Ensemble Voting System for Anomaly Based Network Intrusion Detection

This paper proposes an Ensemble Voting System for Anomaly-Based Network Intrusion Detection, crucial in safeguarding modern telecommunication and information networks. Utilizing data mining techniques and the KDDCup 1999 dataset, the study evaluates the performance of various classifiers [15, 16]. The results demonstrate the superiority of the proposed voting ensemble technique, showcasing significantly better intrusion detection capabilities compared to existing methods. The approach proves efficient in terms of accuracy, low false positive rates, and quick model building [17]. However, challenges related to ensemble comprehensibility are acknowledged, pointing to a potential direction for future research to enhance the user's understanding of ensemble methods.

F. An Ensemble of Prediction and Learning Mechanism for Improving Accuracy of Anomaly Detection in Network Intrusion Environments

This paper introduces an innovative intrusion detection system utilizing an ensemble of prediction and learning mechanisms to enhance anomaly detection accuracy in network intrusion environments. Leveraging automated machine learning and Kalman filter-based prediction models, the proposed system achieves high accuracy rates of 98.801% on the UNSW-NB15 dataset and 97.02% on the CICIDS2017 dataset [18]. Performance comparisons with contemporary models highlight significant improvements in intrusion accuracy, detection rate, and F1 score. The study emphasizes the need to adapt data mining and statistical methods to address challenges posed by the increasing complexity of internet applications, paving the way for future applications in IoT-cloud environments.

G. A novel ensemble learning-based model for network intrusion detection

This paper introduces an ensemble learning-based model for network intrusion detection, leveraging Gaussian naive Bayes, logistic regression, and decision tree as base classifiers and stochastic gradient descent as the meta- classifier. Evaluated on KDD Cup 1999, UNSW-NB15, and CIC-IDS2017 datasets, the ensemble model significantly improves overall performance, reducing false positives and enhancing accuracy [19–21].While effective for high class imbalance datasets, there is room for further improvements in detecting specific attacks. The study encourages exploring data augmentation and cost-sensitive learning to address class imbalance challenges in intrusion detection systems.

5 Methodology

Based on the provided diagram, which outlines the process flow, the research methodology as shown in Fig. 1 of the proposed network intrusion detection system can be explained based on the provided diagram, which outlines the process flow:

1. **Data Collection**: The system operates in a real network environment where network traffic and events are continuously monitored. Data is collected from this environment. This data is used as input to the detection system [22].
2. **Preprocessing**: Once the data has been collected, it is goes through a preprocessing phase. This step involves cleaning and transforming the data to ensure it is suitable for training and recognition. Preprocessing could include tasks such as removing irrelevant features, normalizing the data, and handling missing values [23].
3. **Training and System Model**:

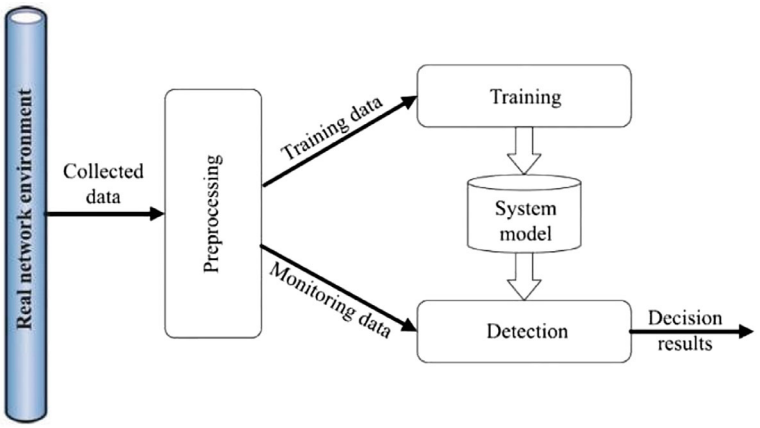


Fig. 1 Research methodology

- The preprocessed data is divided into two sets: training data and monitoring data.
- The training data is used to develop a system model. Machine learning algorithms are used here to learn from the labeled data. The goal of this phase is to build an accurate and effective model that can identify patterns in network activity [24].
- The system model can use various ensemble machine learning techniques such as Random Forest, Adaboost, Bagging, Naive Bayes, and Decision Trees, as mentioned earlier [25].

4. **Detection**: Once the model has been trained, the system enters the **detection** phase where it evaluates the incoming monitoring data from the network [26]. The model compares the monitoring data with the learned patterns from the training phase to detect anomalies or potential threats.
5. **Decision Results**: The system outputs decision results based on its analysis. These results could classify network activity as either benign or malicious. In this context, malicious activity would indicate network intrusions or attacks, and the system would raise an alert or take appropriate action to mitigate the threat [27].

6 Result Analysis

The evaluation of the ensemble-based machine-learning technique for network intrusion detection revealed nuanced performances among diverse algorithms. The Bagging Classifier exhibited exceptional results with perfect accuracy, precision, recall, and F1 score, emphasizing its robustness. Similarly, the Random Forest Classifier displayed flawless performance, underlining its effectiveness. Notably, the KNeighbors Classifier Model demonstrated high accuracy and outstanding precision, recall, and F1 score. In contrast, Gaussian Naive Bayes struggled with a notably lower accuracy and higher classification error. The ensemble approach showcased its strength in amalgamating diverse classifiers, with standout algorithms like Bagging, Random Forest, and KNeighbors Classifier, emphasizing the potential for creating a potent network intrusion detection system.

1. Accuracy is a metric used to calculate the ratio of the number of correct predictions divided by the total number of predictions to measure the model's ability to correctly predict the output (class label). A high accuracy indicates that the model is making correct predictions overall Accuracy.
2. Precision is a metric used to measure how many true positive predictions made by the model are true in the dataset, It represents the accuracy of the positive prediction made by the model. It is calculated by dividing the true positives by the total number of positive predictions made by the model. A higher precision means that the model is making accurate predictions

3. Recall is a metric used to measure how many of all positive instance in the dataset were correctly predicted as positive by the model. It's calculated by dividing the true positives by the sum of true positives and false negatives to the sum of true positive and false negative. A high recall indicates that the model is unlikely to miss positive outcomes and is more sensitive to identifying them
4. F1-score is a metric that combines precision and recall into a single measure to assess the effectiveness of a prediction model. As it combines both precision and recall into single value, it provides a balanced measure of the model's accuracy and also f1 score shows the robustness of the prediction model

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN} \tag{1}$$

$$\text{Precision} = \frac{TP}{TP + FP} \tag{2}$$

$$\text{Recall} = \frac{TP}{TP + FN} \tag{3}$$

$$\text{F1 - Score} = \frac{2TP}{2TP + FN + FP} \tag{4}$$

7 Discussion and Conclusion

Network intrusion detection is a critical aspect of securing computer networks against unauthorized access and cyber-attacks. Traditional Network Intrusion Detection Systems (NIDS) face challenges in identifying unknown sophisticated threats due to their reliance on signature-based detection. This research introduces an innovative ensemble-based machine-learning technique for network intrusion detection, utilizing the CICIDS 2017 dataset (Table 1).

In our exploration, the limitations of signature-based detection became apparent, necessitating a shift towards more adaptive approaches. Anomaly-based automated detection, particularly through ensemble machine-learning techniques, emerged as a superior alternative. The versatility of ensemble strategies, including Random Forest, Adaboost, Bagging, and various Naive Bayes classifiers, showcased a significant leap forward in addressing the dynamic nature of cyber threats.

The rigorous evaluation on the CICIDS 2017 dataset allowed us to assess the proposed approach comprehensively. Leveraging correlation analysis for feature selection optimized the algorithm's efficiency, contributing to a more robust and resilient detection system. This approach reflects a commitment to innovation and practicality in enhancing intrusion detection capabilities.

Our research reveals that the Random Forest technique consistently outperforms existing methods, achieving accuracy and False Positive Rate (FPR) levels typically exceeding 99.9%. This not only reaffirms the efficacy of ensemble learning but also

Table 1 Algorithms result

Alto			Classification error	Average precision	Average recall	Average F1 score
AdaBoost Cla			0.11	0.81	0.89	0.85
Bagging Classifier			0	1	1	1
Bernoulli Naïve Baye Model			0.43	0.91	057	0.67
Gaussian Naïve Bayes	0.36		0.84	0.91	0.16	0.18
Random forest classifier	1		0	1	1	1
KNeighborsClassifier Model	0.99		0.01	0.99	0.99	0.99
Decision Tree Model	0.87	0.9	0.06	0.94	O.94	0.94
Multinomial Naïve Bayes	0.8	0.88	0.12	0.9	0.88	0.89

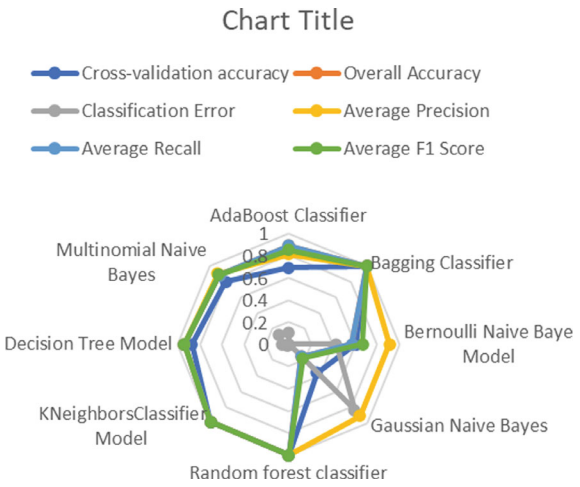


Fig. 2 Algorithms comparison according cross validation accuracy, classification error, average recall, overall accuracy, average precision, average F1 score

establishes our anomaly-based technique as a valuable tool for fortifying computer systems and networks against emerging cyber threats.

In conclusion, this innovative strategy, incorporating a range of ensemble methods and robust evaluation metrics, lays the foundation for future advancements in adaptive, machine-learning-driven network intrusion detection. The success of our anomaly-based technique marks a significant contribution to the ongoing efforts to secure digital infrastructures. As we move forward, the adaptability and accuracy demonstrated in this research hold promise for shaping the future landscape of network security (Fig. 2).

Abbreviations and Acronyms

NIDS	Network Intrusion Detection System
CICIDS	2017 Dataset for network intrusion
DNN	Deep Neural Network
GAN	Generative Adversarial Network
FPR	False Positive Rate
DdoS	Distributed Denial of Service

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Navigating the Digital Wealth Landscape: Opportunities and Challenges in WealthTech Adoption



Joan Merin Saji, K. P. Jaheer Mukthar, and Hayel Khafajeh

Abstract The article explains how digital wealth platforms may improve financial services' usability, effectiveness, and customisation while highlighting cutting-edge uses and the implications for the sector. The article examines the variety of obstacles preventing WealthTech from being widely adopted. Potential mitigation techniques are examined along with regulatory challenges, cybersecurity concerns, and entrenched hostility from investors and established financial firms. Utilizing an array of case studies, the study evaluates the tactics, insights, and results of businesses that effectively incorporate WealthTech solutions. It condenses best practices and practical ideas for successfully navigating the digital wealth world. Future trends and the implications of WealthTech adoption are examined, with particular attention paid to the revolutionary potential of emerging technologies like big data analytics, blockchain, and artificial intelligence. Key findings are summarized, opportunities and limitations are reiterated, and useful suggestions are provided for stakeholders interested in effectively utilizing WealthTech before the paper closes.

Keywords Digital wealth landscape · WealthTech · Wealth management · Financial technology · Financial institutions

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1 Introduction

Wealth management is entering a revolutionary period as a result of the digital revolution, which is changing conventional methods and opening the door for creative solutions. We give a summary of the digital wealth environment in this introduction, emphasizing the increasing importance of technology and how it is changing wealth management services and tactics. Every element of our lives has been more entwined with technology in recent years, and the financial industry is no exception. Blockchain-based solutions, artificial intelligence-driven analytics, complex algorithms, automated investment platforms, and other technological innovations are all part of the digital wealth landscape. [1] It is parsimonious and simple, and comparing against this benchmark is conservative because it is highly selected (the characteristics it includes are routinely demonstrated to be among the most robust return predictors).

Technology's function in wealth management has changed from being merely supportive to acting as the main engine for strategic decision-making. Both private investors and financial institutions are using technology to improve client experiences overall, optimize investment strategies, and obtain deeper insights. Furthermore, the digital wealth landscape is distinguished by its capacity to democratize financial services accessibility, dismantle obstacles to entry, and enable a wider range of investors to engage in wealth-building endeavors. Technology has democratized wealth management in ways never seen before, from peer-to-peer lending platforms enabling capital allocation to robo-advisors providing individualized financial advice. With the speed at which technology is developing, more changes to the digital wealth landscape are anticipated. Blockchain, big data analytics, and machine learning are examples of emerging technologies that have the potential to completely change the way that wealth is dispersed, managed, and assigned [2].

Given this, it is critical to acknowledge the significant influence technology has on wealth management as well as the opportunities it offers to investors, wealth managers, and financial institutions. These opportunities do, however, come with difficulties, such as the need to comply with regulations, cybersecurity threats, and moral issues pertaining to data protection. The present study delves further into the prospects and obstacles present in the digital wealth terrain, scrutinizing the ways in which technology is influencing the trajectory of wealth management and the tactics required to adeptly maneuver through this ever-changing milieu. We seek to shed light on the changing role of technology in wealth management and the ramifications for various financial players through a thorough analysis [3].

The advent of the digital wealth landscape includes how technology has revolutionized conventional wealth management techniques. The term "WealthTech" originated from the way that recent technological developments have reshaped the way that both individuals and institutions manage their money. A combination of the words "wealth" and "technology," "wealthtech" describes the creative use of technology to improve and simplify a number of elements of wealth management. Financial planning, asset allocation, portfolio management, and investment advice

services are a few examples of this. The potential of WealthTech to democratize access to advanced wealth management tools and techniques is what makes it significant in today's financial services. WealthTech platforms help individual investors and financial institutions make better decisions, maximize investment returns, and reach their financial objectives more quickly by utilizing automation, data analytics, artificial intelligence, and other cutting-edge technology [4].

WealthTech offers more affordable options, increased transparency, and individualized services catered to each client's specific requirements and preferences, all of which have the potential to upend established financial structures. As a result, it signifies a paradigm shift in the wealth management sector that is fostering accessibility, efficiency, and creativity like never before. WealthTech represents a significant shift in the way that money is allocated and managed in the digital era. Its importance in contemporary financial services highlights how technology is transforming the wealth management industry and creating new opportunities for both institutions and investors [4].

Objectives

- Assessing the Current Landscape entails carrying out a thorough examination of the WealthTech platforms, goods, and services that are currently on the market.
- Recognizing the possible advantages and prospects provided by WealthTech solutions, including enhanced accessibility, customized financial guidance, economical viability, and expandability.
- Examining the obstacles and difficulties impeding the extensive integration of WealthTech, including as adherence to regulations, apprehensions regarding data security, reliance on clients, and technological constraints.

Opportunities in Wealhtech

Through a variety of features and functionalities, digital wealth platforms have the ability to greatly improve financial services' accessibility, effectiveness, and customisation. By offering online and mobile access to investment options and financial advice, digital wealth platforms can remove conventional obstacles to financial services. This implies that people can now engage in the financial markets who might have been shut out of traditional wealth management services because of time limits, geographic restrictions, or high entry barriers. These platforms sometimes have minimal minimum investment requirements, which makes it simpler for people with little money to begin investing. Furthermore, they frequently have intuitive user interfaces and educational materials that aid in demystifying intricate financial ideas and provide accessibility to investing for a wider range of people [2].

Digital wealth platforms can further improve accessibility for investors who might not have the knowledge or resources to manage their investments independently by providing personalized investment strategies that are tailored to individual goals and risk profiles through the use of automated investment solutions (such as roboadvisors).

By using technology, digital wealth platforms simplify the investing process and cut down on the time and resources needed to monitor accounts, make trades, and rebalance portfolios. These platforms are able to execute transactions more quickly

and cheaply than traditional human advisors thanks to automation and algorithm-driven investment methods. Digital wealth platforms have the ability to compile financial data from various sources and accounts, giving investors a real-time, comprehensive picture of their investment performance and overall financial health [1].

Investors are able to respond swiftly to developments in the market and make better selections thanks to this degree of accessibility and transparency. Efficiency is further increased through integration with other financial services and tools, such as goal-tracking tools, tax optimization software, and budgeting apps. These integrations streamline financial management duties and offer comprehensive financial planning solutions. With the great degree of customization offered by digital wealth platforms, investors may personalize their investment strategies and portfolios to suit their own risk tolerance, preferences, and financial objectives. These platforms are able to provide individualized asset allocation recommendations and investment recommendations that take into account the unique circumstances of each investor by using risk assessment questionnaires and data-driven algorithmsa multitude of investment options are available to investors, enabling them to construct diverse portfolios that meet their unique investing goals and inclinations. These options include stocks, bonds, mutual funds, exchange-traded funds (ETFs), and alternative assets.

Digital wealth platforms also give investors the flexibility and agility to manage their assets over time by allowing them to dynamically modify their portfolios and investment strategies in response to changes in the market or their financial objectives. Digital wealth platforms are essential for increasing the efficiency of investing processes, democratizing access to financial services, and enabling investors to tailor their financial plans to meet their own objectives.

Robo-advisors are automated investing systems that manage investment portfolios and offer financial advice using algorithms. Betterment, Wealthfront, and the robo-advisor services provided by established financial firms like Vanguard and Charles Schwab are a few examples. Because they provide inexpensive, automated investing solutions, robo-advisors have democratized access to investment management. Investors looking for ease of use, affordable fees, and customized investment plans will find them appealing. In order to stay competitive, traditional financial advisors have been under pressure from robo-advisors to modify their services and fee schedules. Users of micro-investing apps can make tiny investments in fractional shares of equities, exchange-traded funds (ETFs), or cryptocurrency. Acorns, Stash, and the "fractional shares" option in Robinhood are a few examples.

Younger generations and inexperienced investors who may not have significant sums of money to invest but want to start developing wealth gradually are drawn to micro-investing apps. By automatically making recurring investments or rounding up spare change from regular purchases, these applications foster regular investing habits and financial knowledge. Online comprehensive financial planning and investment management services are provided by digital wealth management platforms. Personal Capital, Ellevest, and SoFi Invest are a few examples. These platforms offer a comprehensive approach to financial planning by fusing tools for goal tracking, retirement planning, and budgeting with automated investment management. They

serve a wide range of customers, from high net worth individuals to millennials, providing individualized portfolio management services and guidance at a fraction of the price of conventional wealth management companies [4].

Machine learning algorithms are used by AI-powered financial advise platforms to evaluate user data, offer tailored financial advice, and maximize investment strategies. Aladdin Wealth from BlackRock and Wealthfront's Path are two examples. These platforms include advanced financial planning tools that evaluate users' risk profiles, ambitions, and financial situations in order to make recommendations that are specifically catered to them. They help investors reach their long-term financial goals, optimize their portfolios, and make better informed decisions. WealthTech is utilizing blockchain technology for a number of purposes, such as asset tokenization, decentralized financing (DeFi) systems, and investment vehicles based on smart contracts. WealthTech solutions built on blockchain technology improve asset management and investment transaction efficiency, security, and transparency. They do away with middlemen, cut expenses, and open up more investment options, especially in alternative assets like digital assets, real estate, and private equity [5]. By democratizing access to financial services, automating investment procedures, personalizing financial advice, and utilizing cutting-edge technologies to improve investment, these examples show how creative WealthTech applications are upending the financial sector.

Challenges in WealthTech Adoption

Many obstacles and difficulties exist for WealthTech solutions adoption, which may prevent these technologies from being widely used and adopted. WealthTech solutions must comply with a number of legal criteria, such as investment advice standards, data protection legislation, and anti-money laundering (AML) regulations. It can be difficult and expensive to comply with these requirements, especially for new businesses and smaller companies with limited funding. Navigating legal frameworks across several jurisdictions is a difficulty for WealthTech providers because to regulatory uncertainty and changing compliance demands. WealthTech platforms are appealing targets for cyberattacks and data breaches because they manage sensitive financial and personal data [6].

It is crucial to keep strong cybersecurity safeguards in place to safeguard customer data, but doing so calls for ongoing investments in knowledge and technology. Complying with data protection laws like the CCPA and GDPR presents an extra challenge for WealthTech companies, especially those with international operations. Even with the advantages of investing techniques driven by algorithms and automation, some investors could be reluctant to entrust digital platforms with their money [2]. The trust in WealthTech solutions may be eroded by worries about algorithmic biases, a lack of human monitoring, and the possibility of mistakes or system failures. Overcoming these perception hurdles requires developing trust and credibility by open and honest communication, helpful resources, and attentive customer service. It takes a substantial investment in software development, personnel recruiting, and technical infrastructure to create and manage complex WealthTech systems. With less resources and less technological know-how, smaller businesses could find it difficult to compete with larger market leaders or fintech startups. The integration

and scalability of WealthTech solutions might also be hampered by legacy systems and antiquated technological infrastructure seen in traditional financial institutions [3].

Wealth managers and financial advisers may oppose the use of WealthTech solutions because they fear losing their jobs, losing their clientele, or having their knowledge and value proposition compromised. Effective change management techniques, continual education and training, and clear communication about the advantages of technology-enabled wealth management are necessary to overcome reluctance to change [7].

WealthTech solutions can be inclusive and accessible, but there is still a digital divide in which some groups of people—older people, those living in rural regions, etc.—may not have access to digital devices or the internet. To mitigate these accessibility issues, WealthTech systems should be made user-friendly, compatible with many devices, and offered in multiple languages. With a wide spectrum of participants, including independent advisors, fintech startups, digital giants, and traditional financial institutions, the wealth management market is extremely fragmented. As a result of this fragmentation, WealthTech suppliers may face pricing pressure, market saturation, and fierce rivalry. Collaboration between regulators, industry stakeholders, and technology providers is necessary to address these obstacles and challenges. This includes fostering a supportive regulatory environment, advancing cybersecurity best practices, fostering investor trust, making investments in innovation and talent development, and guaranteeing equitable access to wealth management solutions enabled by technology [8].

WealthTech companies face a great deal of difficulty adhering to regulations since financial services are subject to strict guidelines designed to safeguard consumers and preserve market integrity.

WealthTech businesses have to abide by a complicated web of rules, which includes data protection legislation, know-your-customer (KYC) standards, securities laws, and anti-money laundering (AML) restrictions. Digital wealth management platforms may find it particularly difficult to comply with laws like the Securities Act, Investment Advisers Act, and Dodd-Frank Act since they have to make sure that their automated advise algorithms meet transparency requirements and fiduciary standards. Additional difficulties come from shifting legislation and regulatory ambiguity. WealthTech companies must continually modify their compliance procedures and operational strategies to meet these demands. WealthTech platforms manage sensitive financial and personal data, making them easy targets for hacks. WealthTech companies are susceptible to many cybersecurity threats, such as ransomware attacks, phishing schemes, insider threats, and data breaches. WealthTech organizations and their clients may face financial losses, reputational harm, regulatory fines, and legal ramifications as a result of a cybersecurity attack. Ensuring robust cybersecurity measures, such as encryption, multi-factor authentication, intrusion detection systems, and regular security audits, is essential to mitigate cybersecurity risks and protect sensitive client data [9].

Large volumes of personal and financial data are gathered and processed by wealthtech companies from their clientele, which raises privacy and confidentiality

issues. Clients' concerns over WealthTech companies' data collection, storage, usage, and sharing are growing, particularly in the wake of high-profile privacy scandals and data breaches. To preserve the security and privacy of customer data, WealthTech companies must adhere to data protection laws like the California Consumer Privacy Act (CCPA) in the US and the General Data Protection Regulation (GDPR) in the EU. In order to address data privacy issues and foster client trust, it is imperative to have strong data governance procedures, such as data encryption, anonymization, access limits, and data breach response plans [10].

WealthTech companies, regulators, and industry stakeholders must work together to overcome these obstacles and hurdles in order to create legislative frameworks that promote innovation while preserving consumer protection, cybersecurity, and data privacy. To gain client trust and reduce risks related to cybersecurity, data privacy, and regulatory compliance, wealth tech companies should emphasize compliance, invest in cybersecurity defenses, and embrace privacy-by-design principles [11].

Adoption of WealthTech solutions is severely hampered by investors' and traditional financial institutions' resistance to change. WealthTech solutions may face resistance from traditional financial institutions because they see them as a challenge to their established business strategies and areas of expertise.Financial advisors and wealth managers may believe that automated investment platforms take away from the importance of human counsel and one-on-one interactions with clients, giving them less control over client relationships and investment choices. Conventional financial organizations frequently have deeply ingrained organizational cultures and structures that are resistant to innovation and change [12].

Within traditional financial businesses, the adoption of new technology and business models can be impeded by bureaucratic inertia, obsolete processes, and legacy systems. Due to worries about legal ramifications and regulatory compliance, traditional financial institutions may be reluctant to implement WealthTech solutions because they operate in a highly regulated environment. For WealthTech companies as well as traditional financial institutions, complying with complicated regulatory requirements including fiduciary standards, suitability restrictions, and data protection legislation can be difficult. Investors may be reluctant to accept new technology and investment methods provided by WealthTech platforms, especially if they are conservative or risk averse. Investors may not embrace WealthTech solutions if they have concerns about the performance, security, and dependability of digital platforms and automated investment algorithms [13].

Concerns over data privacy, cybersecurity threats, and the transparency of automated investment algorithms may cause investors to mistrust WealthTech platforms. It is imperative for WealthTech companies to exhibit transparency, accountability, and reliability in order to surmount investor skepticism and establish market reputation. Personalized guidance and face-to-face engagement provided by conventional financial advisors may be preferred by certain investors over automated investment platforms. To satisfy the various needs and preferences of investors, wealth tech companies must strike a balance between the advantages of automation and scalability and the requirement for a personal touch and customized service. In order

to overcome investors' and traditional financial institutions' aversion to change, interacting with stakeholders to learn about their requirements and worries.

showcasing the benefits of WealthTech solutions, such as reduced costs, more convenience, and better investment results. Clearing up misunderstandings regarding automated investment platforms and educating investors on the advantages and dangers of digital asset management. Establishing regulatory frameworks that support innovation, consumer protection, and market integrity in cooperation with regulators and industry groupings [14].

To address regulatory compliance, data privacy, and cybersecurity issues, investments should be made in cybersecurity defenses, compliance skills, and client trust-building programs. Utilizing alliances and partnerships with established financial institutions to promote adoption and efficiently grow their enterprises. WealthTech companies may get over reluctance to change and seize chances for expansion, innovation, and value creation in the financial services sector by tackling these obstacles and difficulties [15].

Case Studies

- ***Betterment:***

Retail investors can get automated investment management services through Betterment, a top robo-advisor platform. By utilizing technology to offer goal-based financial planning, portfolio management, and customized investment advice, Betterment has effectively integrated WealthTech solutions. Betterment's platform has experienced considerable growth and adoption due to its user-friendly design, cheap fees, and varied investment portfolios, which have drawn a wide customer base. Betterment oversees more than $30 billion in assets under management (AUM) as of 2021.

Personal Capital:

Personal Capital is a digital wealth management platform that offers a suite of financial tools and services, including investment management, retirement planning, and wealth tracking. Personal Capital has successfully implemented WealthTech solutions by combining automated investment management with personalized financial advice from human advisors. Personal Capital's holistic approach to financial planning has resonated with investors seeking comprehensive wealth management solutions. The company has experienced rapid growth and currently manages over $17 billion in AUM.

Acorns:

Acorns is a micro-investing app that allows users to invest spare change from everyday purchases into diversified investment portfolios. Acorns has successfully implemented WealthTech solutions by leveraging automation and behavioral finance principles to encourage regular investing habits among users. Acorns has attracted a large user base, particularly among millennials and novice investors, by making investing accessible, convenient, and affordable. The app has over 9 million users and manages billions of dollars in AUM.

Wealthfront:

Wealthfront is a robo-advisor platform that offers automated investment management and financial planning services. Wealthfront has successfully implemented WealthTech solutions by leveraging technology to optimize investment strategies, tax efficiency, and portfolio rebalancing. Wealthfront's low fees, tax-loss harvesting, and risk-parity investment approach have resonated with investors seeking passive, long-term investment solutions. The company manages over $25 billion in AUM and continues to grow its user base.

SoFi Invest:

SoFi Invest is an online brokerage platform that offers commission-free trading, robo-advisor services, and financial planning tools. SoFi Invest has successfully implemented WealthTech solutions by integrating investment management with other financial products and services, including student loan refinancing, personal loans, and mortgage lending. SoFi Invest's integrated approach to financial services has attracted a diverse customer base, including young professionals, students, and first-time investors. The company has experienced significant growth and expansion into new markets.

These case studies show how businesses and organizations have successfully incorporated WealthTech solutions to draw clients, upend the financial services sector, and see notable growth and platform acceptance. These businesses have revolutionized the way people save, invest, and handle their money via creativity, technology, and customer-focused strategies. Effectively navigating the digital wealth landscape necessitates a blend of technology innovation, customer-centricity, regulatory compliance, and strategic strategy. Keep yourself updated with customer preferences, market trends, and the competitive environment in the digital wealth sector. To predict changes in the market and modify your plans appropriately, keep an eye on emerging opportunities, regulatory changes, and technology improvements.

Set measurable goals and a logical plan of action that complement your value proposition, target market, and business objectives. Establish your differentiation approach and unique selling proposition (USP) to make an impression in the congested digital wealth market. To improve the scalability, effectiveness, and user experience of your digital wealth platform, embrace innovation and technology. To promote innovation and distinction, make investments in cutting-edge technologies like blockchain, data analytics, artificial intelligence, and machine learning. Make sure that the rules regulating digital wealth management, such as those pertaining to securities, data protection, and anti-money laundering (AML), are strictly followed. To ensure regulatory compliance and reduce regulatory risks, implement strong compliance processes, risk management frameworks, and internal controls. Put strong data security and cybersecurity procedures in place to secure sensitive customer information and reduce cyber risks. To guard against data breaches and cyber threats, encrypt data, use multi-factor authentication, and carry out security audits and assessments on a regular basis. Provide individualized portfolio management services, investment suggestions, and financial advice based on the needs, preferences, and objectives of each customer. By giving accurate information about costs, investment options, and dangers related to digital wealth management services, you may improve openness and disclosure [16].

Gain clients' trust and credibility by acting with honesty, professionalism, and openness in all of your dealings. Give your clients the knowledge they need to make wise financial decisions by educating them about the advantages and dangers of digital wealth management.

Create streamlined digital experiences and user-friendly, intuitive interfaces that improve accessibility, usability, and client engagement. To provide a unified and practical user experience across many touchpoints, allocate resources towards omnichannel integration, mobile optimization, and user experience (UX) design. Encourage client involvement and allegiance by means of proactive correspondence, tailored suggestions, and enhanced services. Offering clients financial planning tools, investment information, and instructional materials will empower them and improve their relationship with your business. Adopt a culture of innovation and ongoing development to keep up with changing customer demands and market trends. Try out new products, services, and company strategies to promote differentiation, creativity, and long-term success in the digital wealth market [17].

Future Directions and Implications

The financial services sector is changing, and people's approaches to saving, investing, and managing their wealth are changing too. This is due to emerging trends and future advances in WealthTech. Algorithms for artificial intelligence and machine learning are being utilized more and more to streamline portfolio management, automate investment decision-making, and provide personalized financial advice. Artificial intelligence (AI)-driven chatbots and virtual assistants are enhancing customer service and engagement by offering users immediate assistance and tailored recommendations. Tokenization of assets is made possible by blockchain technology, which also makes it easier to issue, trade, and settle cryptocurrencies, digital securities, and other alternative assets. Blockchain technology is being used by decentralized finance (DeFi) platforms to provide cutting-edge financial services and products like decentralized lending, borrowing, and trading [19].

Because they provide automated investment management services at a fraction of the price of traditional wealth management organizations, robo-advisors are still becoming more and more popular. Hybrid advisory models are starting to appear; they combine human advisors with automated investment algorithms to offer a comprehensive and individualised approach to asset management and financial planning. To cater to the varied requirements and inclinations of individual investors, wealth technology companies are placing a greater emphasis on personalization and customization. Personalized asset allocations, financial planning strategies, and investment recommendations are generated by analyzing user data using advanced data analytics and predictive modeling approaches [20]. WealthTech companies may reduce regulatory risks, automate compliance procedures, and negotiate complex regulatory requirements with the use of RegTech solutions.

RegTech is significantly advancing efficiency and transparency in regulatory reporting, know-your-customer (KYC) verification, and anti-money laundering (AML) screening. Demand for impact investing and sustainable solutions that meet environmental, social, and governance (ESG) standards is rising [16]. WealthTech platforms are enabling investors to factor their values and preferences into their

investing decisions by incorporating ESG data and analysis into their investment plans. WealthTech companies now have access to and the ability to evaluate a vast array of financial data from several sources thanks to open banking initiatives and data aggregation technology. WealthTech platforms can give a client a complete picture of their financial situation and individualized financial advice and suggestions by compiling financial data from bank accounts, investment accounts, and other financial organizations. Behavioral finance principles and gamification techniques are being used to encourage positive financial behaviors and improve investor engagement [17].

Features such as goal-based investing, progress tracking, and rewards systems are designed to motivate users to save more, invest wisely, and achieve their financial goals. AI and machine learning algorithms are increasingly being used to automate investment decision-making, personalize financial advice, and optimize portfolio management. AI-powered chatbots and virtual assistants are improving customer service and engagement by providing instant support and personalized recommendations to users. Blockchain technology is enabling the tokenization of assets, facilitating the issuance, trading, and settlement of digital securities, cryptocurrencies, and other alternative assets. Decentralized finance (DeFi) platforms are leveraging blockchain to offer innovative financial products and services, such as decentralized lending, borrowing, and trading. Because they provide automated investment management services at a fraction of the price of traditional wealth management organizations, robo-advisors are still becoming more and more popular. Hybrid advisory models are starting to appear; they combine human advisors with automated investment algorithms to offer a comprehensive and individualised approach to asset management and financial planning [18].

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are being applied. Users are encouraged to save more, make wise investment decisions, and reach their financial objectives through features like goal-based investing, progress tracking, and incentive programs. WealthTech companies may seize new possibilities, set themselves apart from competitors, and provide creative solutions that satisfy changing investor demands and tastes in the digital era by keeping up with these new trends and advancements. The evolution of digital wealth management could be profoundly impacted by the integration of technologies like big data analytics, blockchain, and artificial intelligence (AI). These technologies could revolutionize the delivery of financial services and improve accessibility, efficiency, and personalization [21].

Large volumes of data, such as investing preferences, risk tolerance, and financial objectives, can be analyzed by AI algorithms to produce individualized financial recommendations for each investor. Investment portfolios can be managed effectively and economically with the help of AI-powered robo-advisors, which can automate the creation, rebalancing, and optimization of portfolios. Artificial Intelligence (AI) has the potential to improve risk management and investment decisions by utilizing predictive analytics to forecast market trends, discover investment opportunities, and analyze portfolio risk. Enhanced Security and Transparency: Blockchain technology lowers the risk of fraud, manipulation, and unauthorized access to customer data and assets by providing a decentralized and immutable record [22].

Traditional assets like real estate, artwork, and equities can now be tokenized thanks to blockchain technology, enabling fractional ownership, more liquidity, and round-the-clock trade of formerly illiquid assets. Blockchain-based smart contracts streamline investment operations by automating investment procedures, upholding contracts, and enabling peer-to-peer transactions. This eliminates the need for middlemen.

Financial advice and services can be more precisely tailored to the requirements and tastes of individual clients by using big data analytics to examine investment behavior, sentiment, and preferences [23]. Through the examination of past market data, the discovery of correlations and trends, and the stress testing of investment strategies under diverse conditions, big data analytics approaches can evaluate and reduce portfolio risk. Wealth managers can more successfully customize their services and investment advice to various customer categories by using big data analytics to segment clients based on demographics, risk profiles, and investment objectives.

Digital wealth management could undergo a revolution with the combination of AI, blockchain, and big data analytics, as it could lead to increased efficiency, personalization, security, and accessibility to financial services. Wealth management companies may maintain their competitiveness, satisfy changing investor demands, and provide value-added services in a world that is becoming more digital and data-driven by utilizing these technologies wisely [24].

The financial sector and society at large will be greatly impacted by the adoption of WealthTech, which touches on a number of issues including accessibility, efficiency, innovation, and societal effect [11]. Because wealthTech platforms reduce entrance barriers and increase accessibility to investment opportunities for people

of all income levels, they have democratized access to wealth management services. By enabling a larger portion of the populace to engage in wealth generation and the financial markets, this democratization has the potential to lessen wealth inequality. By targeting underserved groups like the unbanked and underbanked, who might not have easy access to traditional financial services, wealthtech solutions can advance financial inclusion. To assist people in saving money, increasing their financial literacy, and achieving long-term financial stability, digital wealth management platforms can offer investment choices, budgeting tools, and financial education. Adoption of wealthTech by financial institutions can lower costs and increase operational efficiency by automating repetitive procedures, optimizing workflows, and doing away with paper documentation. Investors can gain from cheaper costs and better investment returns by using automated investing platforms and robo-advisors, which can provide affordable investment management solutions at lower rates than traditional wealth management businesses [25, 26]].

WealthTech uses cutting-edge technology like big data analytics, blockchain, and artificial intelligence to promote technical innovation and advancement in the financial sector. In response to shifting consumer tastes and market needs, traditional financial institutions are compelled to innovate and adapt, which in turn stimulates competition and product development. Concerns regarding data privacy, cybersecurity, and the safeguarding of sensitive financial information are brought up by the broad use of wealth technology [27]. For wealth tech companies to secure customer data and guard against cyberattacks and data breaches, they need to have strong cybersecurity measures in place, prioritize data security, and adhere to legal requirements.

The regulatory environment around the adoption of WealthTech is complicated and changing quickly, which presents difficulties for legislators, regulators, and financial institutions [28].

To maintain consumer protection, market integrity, and regulatory compliance, wealthtech companies must manage regulatory compliance requirements, such as securities laws, anti-money laundering (AML) rules, and data protection laws. The disruption caused by wealth tech presents both opportunities and problems for banks, wealth management companies, and financial advisors, among other traditional financial organizations. If traditional businesses want to stay competitive in the rapidly changing WealthTech market, they need to embrace digital transformation, innovate, and modify their business models [29]. Otherwise, they run the danger of falling behind more nimble and tech-savvy competitors.

The implementation of WealthTech has the capacity to propel economic expansion, endorse fiscal stability, and encourage investment in the economy by enabling the mobilization of savings, directing funds towards profitable ventures, and cultivating innovation and entrepreneurship. Adoption of WealthTech has broad ramifications for society and the financial sector, including innovation and technological advancement as well as improved accessibility and efficiency [30]. WealthTech adoption raises important questions about data privacy, cybersecurity, regulatory compliance, and the future of traditional financial institutions in a world that is becoming more digitally and globally interconnected, all while providing opportunities for financial inclusion, cost reduction, and economic growth [31].

Recommendation

Tailor WealthTech solutions to address specific needs and deliver value-added services that meet the diverse requirements of stakeholders. Allocate resources and invest in cutting-edge technologies such as artificial intelligence, blockchain, and big data analytics to drive innovation and differentiate WealthTech offerings. Collaborate with technology partners, startups, and industry experts to leverage emerging technologies and stay ahead of market trends. Establish robust compliance processes, risk management frameworks, and internal controls to ensure regulatory compliance and mitigate legal and reputational risks. Implement stringent data security measures, including encryption, access controls, and cybersecurity protocols, to protect sensitive client information and mitigate cyber threats. Foster transparency, integrity, and accountability in all aspects of WealthTech operations, including fee structures, investment strategies, and client communication.

Educate clients about the benefits and risks of digital wealth management, provide clear disclosures, and address client concerns to build trust and confidence in WealthTech solutions. Design intuitive, user-friendly interfaces and seamless digital experiences that enhance usability, accessibility, and engagement for clients. Prioritize mobile optimization, responsive design, and omnichannel integration to ensure a consistent and convenient user experience across multiple devices and touchpoints. Leverage AI, data analytics, and machine learning algorithms to provide personalized financial advice, tailored investment recommendations, and customized portfolio management strategies. Empower clients to set financial goals, track progress, and make informed decisions by offering interactive tools, educational resources, and real-time insights. Collaborate with financial institutions, technology providers, regulators, and industry associations to foster innovation, share best practices, and address common challenges in the WealthTech ecosystem. Form strategic partnerships and alliances with complementary firms to expand service offerings, reach new markets, and enhance value proposition for clients. Stay abreast of market trends, regulatory developments, and emerging technologies to anticipate changes in the WealthTech landscape and adapt strategies accordingly. Foster a culture of innovation, agility, and continuous improvement to respond effectively to evolving client needs, market dynamics, and competitive pressures.

Conclusion

The study examines the state of digital wealth, emphasizing the benefits and drawbacks of WealthTech adoption. A wider variety of investors can now more easily access financial services because to the democratization of access provided by digital asset management platforms. For wealth management companies, automation and technology-driven solutions increase scalability, lower costs, and improve operational efficiency. For individual investors, AI and data analytics enable customized portfolio management, individualized investment strategies, and personalized financial advice. WealthTech encourages technical innovation and advancement, which propels market expansion, product creation, and competitiveness in the financial sector. WealthTech companies face difficulties due to complex and constantly changing regulatory requirements, such as securities legislation, data protection regulations, and anti-money laundering (AML) standards. Risks related to cybersecurity,

data privacy, and the security of private financial information provide obstacles to WealthTech adoption and client confidence. For WealthTech companies, gaining and retaining client trust is essential, particularly when it comes to responsibility, dependability, and transparency in the provision of financial services.

WealthTech adoption has obstacles relating to technological restrictions, including as scalability, interoperability, and interaction with legacy systems, even though technology presents chances for innovation. There are a lot of potential for wealth management to be innovative, efficient, and accessible in the digital wealth landscape. However, in order to fully utilize WealthTech and efficiently traverse the changing digital wealth landscape, issues including regulatory compliance, data security, customer trust, and technological limits must be resolved.

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The Impact of Soft Skills on Organizational Citizenship Behavior



Khaled Alzeaideen, Maan Hussein Mansour, and Manal Ahmad Al-Khatib

Abstract The purpose of this study is to investigate how soft skills and their various components impact organizational citizenship behavior within organizations. Additionally, the study aims to assess the level of soft skills and organizational citizenship behavior among employees of the organization. The study focuses on two variables: the independent variable, which encompassed soft skills and was measured through four dimensions: communication and interpersonal skills, teamwork, problem-solving, and time management; and the dependent variable, which encompassed organizational citizenship behavior and was measured through five dimensions: altruism, courtesy, sportsmanship, civic virtue, and conscientiousness. To conduct the study, a descriptive-analytical approach was utilized, and a questionnaire consisting of 45 items was developed. The questionnaire was distributed to a random sample of 400 employees, resulting in a response rate of 83%. Out of the responses received, 330 questionnaires were deemed valid for analysis. The collected data was statistically analyzed using SPSS/V25. The study yielded several significant findings, with one of the most notable being the statistically significant impact of the combined dimensions of soft skills on organizational citizenship behavior. In the study population, there was an average level of availability of soft skills, while the corporation exhibited a high level of organizational citizenship behavior. To promote the development of soft skills and enhance organizational citizenship

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behavior, the study suggested creating a supportive organizational environment. This can be achieved by incorporating soft skills training into employee development programs and incentivizing and rewarding organizational citizenship behavior appropriately.

Keywords Soft skills · Organizational citizenship behavior · Altruism · Courtesy · Sportsmanship

1 Introduction

Amidst the rapid global development across various aspects of life, organizations are faced with challenges and requirements that necessitate the cultivation of human resources skills beyond formal behavior. Management experts have recently emphasized the significance of "soft skills," a contemporary concept that holds equal importance for both public and private organizations. Soft skills encompass intangible abilities that are not directly linked to specific work outcomes, but rather focus on an individual's capacity to effectively interact with others, present ideas persuasively and courteously, and engage positively with clients. These skills contribute to individuals' readiness to engage in organizational citizenship behavior, which entails voluntary actions that surpass official job requirements and are not explicitly recognized or rewarded. Examples of such behavior include assisting colleagues, volunteering for additional tasks, and actively participating in organizational initiatives. Therefore, it is crucial to explore the connection between soft skills and organizational citizenship behavior within the context of the Social Security Corporation. This exploration will provide valuable insights into the development of these skills, fostering a more positive work environment and establishing strategies to cultivate a culture of cooperation and empathy within the organization.

1.1 Problem and Research Questions

Extensive research and numerous studies have unequivocally demonstrated the immense value of organizational citizenship behavior in gaining a competitive edge. As astutely noted by Katz and Khan, organizations that aim to thrive cannot afford to neglect the active participation of their members as exemplary citizens who surpass their prescribed duties and exhibit spontaneous and innovative behaviors for the betterment of the organization. Merely possessing hard skills, such as analytical thinking, reasoning, and proficiency, is no longer sufficient. The possession of soft skills is equally indispensable, as hard skills may facilitate initial job acquisition, but it is the cultivation of soft skills that is pivotal in sustaining and effectively managing that job [30].

Awan et al. [15] conducted a study that supports the notion that hard skills only contribute to 15% of an individual's success, while the remaining 85% is attributed to soft skills. Given the significance of the Social Security Corporation as a governmental service institution in Jordan, which involves direct interaction with clients, this study aims to explore how the presence of soft skills among employees influences their willingness to engage in organizational citizenship behaviors. The findings of this study can inform human resource practices, training programs, and leadership strategies to create a positive and productive work environment that aligns with the corporation's future objectives. Therefore, the primary research question of this study is:

- Does the presence of soft skills, including communication and interpersonal skills, teamwork, problem-solving, and time management, have an impact on organizational citizenship behavior, encompassing altruism, courtesy, sportsmanship, civic virtue, and conscientiousness, at the Social Security Corporation in Jordan?

1.2 Importance of the Study

By gathering and evaluating the viewpoints of participants, this research sheds light on the influence of soft skills on organizational citizenship behavior within the local setting. It not only clarifies the concepts and dimensions of the variables under investigation but also holds practical significance in its examination of how soft skills impact organizational citizenship behavior within the sole establishment responsible for delivering social security services to all sectors of Jordanian society. With the institution facing various challenges, this study addresses the pressing need to enhance the quality of services provided to citizens. Furthermore, it can serve as a valuable starting point for future researchers, enriching scholarly comprehension of the intricate relationship between these variables.

1.3 Study Objectives

The aim of the study is to understand the nature of the relationship between soft skills with their dimensions (communication and interpersonal skills, teamwork, problem solving and time management) and organizational citizenship behavior with their dimensions (altruism, politeness, sportsmanship, citizenship behavior and conscientiousness) in Social Security Corporation of Jordan. Additionally, the study aims to achieve the following partial objectives:

- Identify the level of implementation of soft skills along with their dimensions (communication and interpersonal skills, teamwork, problem solving and time management) in the Social Security Corporation of Jordan.

- Identify the level of organizational citizenship behavior along with its dimensions (altruism, courtesy, sportsmanship, citizenship behavior, and conscientiousness) in the Social Security Corporation of Jordan.
- Present the results and recommendations from a scientific study that can help improve soft skills and strengthen organizational citizenship behavior among corporate employees, positively reflecting the institution's performance and achieving its goals.

1.4 Study Hypotheses

Based on the problem and objectives of the study, the following hypotheses have been formulated:

- **Main Hypothesis HO1**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on organizational citizenship behavior with its dimensions (altruism, courtesy, sportsmanship, civic virtue, and conscientiousness) at the Social Security Corporation in Jordan." The sub-hypotheses are:
  - **Sub-Hypothesis HO1-1**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on altruism at the Social Security Corporation in Jordan."
  - **Sub-Hypothesis HO1-2**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on courtesy at the Social Security Corporation in Jordan."
  - **Sub-Hypothesis HO1-3**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on sportsmanship at the Social Security Corporation in Jordan."
  - **Sub-Hypothesis HO1-4**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on civic virtue at the Social Security Corporation in Jordan."
  - **Sub-Hypothesis HO1-5**: "There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of soft skills with its dimensions (communication and interpersonal skills, teamwork, problem-solving, and time management) on conscientiousness at the Social Security Corporation in Jordan."

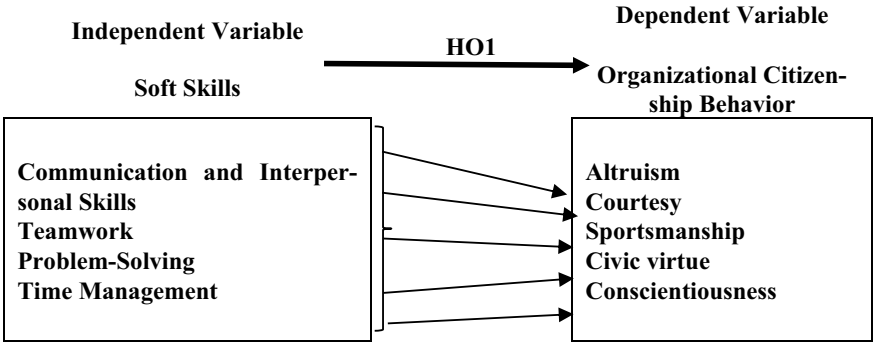


Fig. 1 Study model

1.5 Study Model

The study model and its variables are illustrated in Fig. 1.

Source:

- **Independent Variable (Soft Skills)**: Al-Saqqaf [10], Shawash et al. [32], Al-Zoubi and Al-Zoubi [12], Issa [21], Al-Sharif [14], Chala and Bouranta [19].
- **Dependent Variable (Organizational Citizenship Behavior)**: Abd Al Ghany et al. (2021), Omari and Taybeh [27], Awja [17].

2 Related Works

2.1 Soft Skills

The importance of soft skills to the overall success of individuals, professional and personal, is receiving increasing recognition because these skills are important in creating a positive, collaborative work environment that enables employees to function as a team while communicating effectively and actively participating in decision-making [19]. Additionally, soft skills help increase adaptability and foster innovation, so employees can confidently face any challenge and develop creative solutions to almost any problem they encounter. Therefore, soft skills are crucial to developing a workforce equipped with the right skills to cope with the ever-changing labor market [9].

The holistic range of soft skills, as noted by previous research, includes various personal and social capabilities that enable successful interactions within work environments [5]. In a study by Zakri et al., it was found that the aforesaid skills—including effective communication, teamwork, and problem-solving—are very important for achieving success in one's career. Moreover, soft skills such as

leadership, negotiation, and adaptability play a vital role because they have much impact on professional performance. Emotional intelligence has its own importance in helping individuals manage work-related stress and challenges with great effectiveness, this indirectly improves the overall work environment and promotes collaboration between co-workers [1].

In work settings today which are in a constant state of change it has been proven that to be successful mere technical and cognitive abilities alone are not sufficient. The importance of soft skills is so vital and cannot be underestimated [4]. Indeed, they are now necessary for any individual who wishes to achieve high performance and perfection during the time when reforms are taking place. Job success now demands effective communication, teamwork plus leadership as well as being adaptive to change. These skills help individuals perform their jobs successfully since they ensure one can interact well with others & amp, manage pressures at work. For example, how flexible or creative one is in handling challenges will greatly determine where one ends up on his career ladder [13]. Putra et al. [28] add that these skills also enhance job performance since employees can navigate through their daily challenges as well as daily interactions with colleagues and clients comfortably [7]. Moreover, they improve both professional and personal relationships which create a good working environment and reduce turnover. Soft skills, such as emotional intelligence and empathy allow individuals to understand and relate to others in a positive way which eventually leads to higher job contentment [3]. It further enhances accommodation with changes and pressures that will create development through innovativeness and uncorking talent for the long run of job satisfaction [21].

Dimensions of Soft Skills

- **Communication Skill**: In today's technologically advanced age, the significance of communication skills cannot be overstated for both individuals and organizations. The ability to communicate effectively plays a crucial role in facilitating meaningful interactions that contribute to the successful attainment of communication objectives [18].
- **Teamwork Skill**: The skill of working together encompasses the capacity of individuals to effectively collaborate and synchronize their efforts in order to accomplish shared objectives. This skill encompasses several facets, including proficient communication, clearly defined roles, and the aptitude to handle conflicts in a constructive manner. Successful teamwork hinges on the presence of positive interactions among team members, with each individual contributing their unique expertise and abilities to attain optimal outcomes. This skill serves to boost productivity and expedite the achievement of goals with greater efficiency [2].
- **Problem-Solving Skill**: The capacity to dissect intricate scenarios, pinpoint the underlying factors contributing to issues, and devise viable remedies is an essential aptitude required by individuals in their everyday lives as well as professional environments. This skill plays a pivotal role in achieving prosperity and longevity [24].

- **Time Management Skill**: The ability to manage time is crucial for employees in order to maintain a healthy balance between their work and personal lives. Achieving effective time management requires careful organization and planning, determining how to divide time among different tasks to be completed throughout the day. This involves prioritizing responsibilities, creating schedules, and allocating specific time slots for each activity to efficiently reach desired objectives. By practicing effective time management, individuals can make the most of their day and prevent the stress that arises from a buildup of disorganized tasks [19].

2.2 Organizational Citizenship Behavior

Actions and behaviors exhibited by employees within the workplace that surpass the formal job expectations are known as organizational citizenship behavior (OCB). This behavior is distinguished by its voluntary nature and contributes to the overall improvement of the organization's performance.

In today's workplace, OCB is very important. [2, 4, 6, 8, 10] described it as impromptu employee deeds that are executed without expecting tangible benefits or being rewarded at that specific time. Driven by an internal sense of responsibility and ownership, such that employees are inspired to do more than what is required to help the organization achieve its goals and realize its vision. OCB is very vital in ensuring organizational sustainability through reduction in turn-over rates and absenteeism, increase in employee satisfaction, and building loyalty [8, 22]. For the cultivation and nurturing of this behavior, it is pertinent that organizational leaders create a motivational support work environment where every contribution made by an employee is appreciated [11].

Because organizational citizenship behavior reflects the voluntary way in which employees contribute to the effectiveness and efficiency of the organization, it can be considered important in developing a positive organizational culture as well as in creating effective interdependence between employees and management [6, 35]. Examples of such behaviors include helping co-workers, showing enthusiasm in meetings, taking the initiative to solve problems, and promoting organizational values and ethics. When employees go above and beyond their core job responsibilities, they feel a sense of belonging and loyalty to the organization, which leads to increased job satisfaction and commitment. This, in turn, helps reduce employee turnover, which in turn allows the organization to save on recruitment and training costs [33].

Dimensions of Organizational Citizenship Behavior (OCB)

- **Altruism**: In the context of OCB, altruism refers to employees' genuine willingness to help their co-workers and perform additional tasks without expectation of direct reward. This feature significantly contributes to shaping the spirit of cooperation in the organization [20].
- **Courtesy**: Courtesy refers to employees' polite and respectful interactions with co-workers, taking into account their feelings and needs. This behavior includes

effective and tactful communication and skillful response to various events and situations in the workplace [31].

- **Sportsmanship**: Sportsmanship involves employees accepting decisions and changes in the work environment with a positive attitude and coping with difficult situations with optimism and flexibility. Employees who demonstrate sportsmanship are able to adapt to change and avoid complaining or resisting when faced with challenges [29].
- **Civic Virtue**: Civic virtue is reflected in employees' commitment to professional ethics and organizational standards, with particular emphasis on leading by example in daily interactions, showing great respect for internal regulations, and contributing to a fair and orderly work environment [26].
- **Conscientiousness**: Conscientiousness is the personal commitment of employees to perform their duties with the utmost accuracy and integrity, even in the absence of direct supervision, in order to achieve the best possible results. This behavior improves the quality of work and ensures the effective implementation of organizational goals [34].

2.3 Previous Studies

A comprehensive review of previous studies was conducted to form a theoretical framework and develop a model that serves as the basis for the current study. Among these studies:

- In a recent study conducted by Miano [25], the connection between organizational culture and organizational citizenship behavior (OCB) was investigated, specifically in relation to soft skills. Additionally, the study explored the role of transformational leadership as a mediator in this relationship. The sample size for the study consisted of 324 faculty members, and G-power was utilized to determine the appropriate sample size. One of the findings of the study was that faculty members have a strong organizational culture as well as positive OCB and excellent soft skills for transformational leadership. Second, the study hypothesized that soft skills have a positive impact on OCB-O and OCB-I, while organizational culture has a negative impact on soft skills. This means that higher levels of OCB-O and OCB-I lead to an increase in soft skills, but a strong organizational culture limits the development of soft skills. Third, transformational leadership has a partial mediating effect between OCB and organizational culture and soft skills. However, organizational culture and OCB have a direct impact on soft skills. Overall, the study concludes that educational institutions should focus on developing organizational culture and OCB to improve the soft skills of their lecturers.
- In their research, Khair et al. [23] delved into the process of fostering Organizational Citizenship Behavior (OCB) within the maritime transport sector in Indonesia. The study employed workplace spirituality and job satisfaction as mediators to examine how organizational justice impacts OCB. The sample size

was determined using Structural Equation Modeling (SEM). Data was collected through confidential surveys and interviews to test seven hypotheses put forth. The findings of the study revealed that job satisfaction, organizational justice, and workplace spirituality all had a significant influence on OCB within the maritime transport sector. Furthermore, organizational justice and workplace spirituality were found to enhance job satisfaction and subsequently impact OCB. Based on these findings, the study suggests that management should strive to maintain a sense of fairness within the organization in order to cultivate workplace spirituality and job satisfaction among employees, ultimately fostering OCB. The study also recommends further research in different industries to broaden our understanding of human resource management and explore the relationship between employee performance and company performance in the face of intensifying global competition.

- In their research, Awawdeh and Alkshali [16] set out to explore how soft skills contribute to organizational innovation et al.-Durra Food Products Company (Lavant). Employing a quantitative descriptive approach, the study gathered data from a sample of 106 employees. The independent variable, soft skills, was assessed across five dimensions: communication, time management, leadership, teamwork, and decision-making. Meanwhile, the dependent variable, organizational innovation, was evaluated through four dimensions: introducing new products, improving existing products, innovating new processes, and enhancing existing processes. To analyze the data, the study utilized various statistical methods, with multiple linear regression being particularly noteworthy. The results revealed that both the dimensions of soft skills and organizational innovation were highly prevalent, and there was a significant influence of soft skills on organizational innovation. Notably, leadership, decision-making, and teamwork emerged as the most influential dimensions of soft skills on innovation. Based on these findings, the study recommends prioritizing the development of employees' soft skills through continuous training programs in order to enhance their capacity for innovation and ultimately improve organizational performance.
- In their study, Chala and Bouranta [19] investigated the influence of four essential soft skills (namely adaptability, communication, problem-solving, and teamwork) on the overall performance of employees within the maritime work setting. Furthermore, the study aimed to explore the connection between these soft skills and employees' income levels. To conduct their research, the authors distributed a self-assessment questionnaire to both managers and employees working in Greek shipping companies, resulting in a total of 191 valid questionnaires for analysis. The study utilized various statistical analyses, including exploratory factor analysis, correlation analysis, regression analysis, and variance analysis. The findings of the study revealed a positive correlation between the four identified soft skills (teamwork, problem-solving, adaptability, and communication) and employee performance in the workplace. Additionally, the study confirmed that individuals with strong problem-solving abilities tend to receive higher salaries. In light of these results, the study recommends implementing training courses, seminars, and experiential learning opportunities to foster the development of employees' soft

skills. This is particularly crucial in the shipping industry, which is characterized by continuous evolution and increasing demands.

3 Methodology and Procedures

3.1 Study Population

The study focuses on a diverse group of employees from different departments and job titles within the institution, specifically the general administration, totaling 1604 individuals.

3.2 Sample

To ensure the sample was representative, the researchers referred to the table provided by to determine the appropriate sample size. With a study population of 1604 employees, a minimum of 310 employees was deemed necessary. To select the participants, a random sampling technique was utilized within the institution. The distribution of questionnaires was done electronically through Google Forms, with a total of 400 questionnaires being sent out. Impressively, the response rate reached approximately 83%, with 330 employees successfully completing the questionnaire. This exceeded the required minimum sample size of 310 employees.

3.3 Reliability of the Study Instrument

The reliability of the study variables and dimensions, as demonstrated in Table 1, is evident from the Cronbach's alpha coefficients. Ranging from 0.799 to 0.902, all of these coefficients surpass the minimum acceptable threshold of 0.7 for reliability. Moreover, the overall Cronbach's alpha for the questionnaire is an impressive 0.957. This high level of internal consistency further supports the reliability of the questionnaire and increases the likelihood of obtaining consistent results when using and replicating the scale.

3.4 Testing Study Hypotheses

The subsequent section is dedicated to hypothesis testing, which will encompass a comprehensive explanation of the precise statistical methods and procedures employed to assess the hypotheses put forth in the study. This section will provide

Table 1 Internal consistency analysis of the study instrument using Cronbach's alpha

Items	Variable	Dimensions	Number of items	Cronbach's alpha
1–5	Soft skills	Communication	5	0.872
6–10		Teamwork	5	0.882
11–15		Problem-solving	5	0.879
16–20		Time management	5	0.889
21–25	Organizational citizenship behavior	Altruism	5	0.899
26–30		Courtesy	5	0.902
31–35		Sportsmanship	5	0.832
36–40		Civic virtue	5	0.799
41–45		Conscientiousness	5	0.828
Overall performance			45	0.957

a thorough account of how the data collected will be utilized and the analytical techniques that will be implemented to test the hypotheses.

Testing the Main Hypothesis

- **HO1**: "There is no statistically significant effect ($\alpha \geq 0.05$) of soft skills and their dimensions (communication, teamwork, problem-solving, and time management) on organizational citizenship behavior and its dimensions (altruism, courtesy, sportsmanship, civic virtue, and conscientiousness) at the Public Social Security Corporation."

This hypothesis was tested using Multiple Linear Regression Analysis at a significance level of ($\alpha \geq 0.05$). The results are summarized in the tables below.

The correlation coefficient, denoted as R, signifies the relationship between the dimensions of the independent variable (communication, teamwork, problem-solving, and time management) and the dependent variable (organizational citizenship behavior). According to the data presented in Table 2, a robust and positive correlation of 0.885 exists between the dimensions of the independent variable and the dependent variable. This substantial correlation coefficient further strengthens the conclusion that the dimensions of the independent variable have a statistically significant impact on the dependent variable.

The variance in the dependent variable can be explained by the combined dimensions of the independent variable, as indicated by the coefficient of determination ($R^2 = 0.783$). This means that the dimensions have the capability to account for 78.3% of the variance in organizational citizenship behavior. The remaining percentage of variance is attributed to factors not examined in the study. The adjusted coefficient of determination (Adjusted R^2) is 0.780, with a minimal difference of 0.003 compared to the coefficient of determination. This slight difference suggests that the ability of the independent variables to predict the dependent variable is satisfactory.

Based on the data presented in Table 2, we can observe that the critical F value at degrees of freedom (4/325) is 2.42. Upon comparing this value with the calculated F

Table 2 Summary of the model for the main hypothesis

Independent variable	Dependent variable	Model summary			ANOVA			
Organizational citizenship behavior	Soft skills (all dimensions)	R	R^2	Adjusted R^2	Freedom degree	F	Tabulated F	Sig
		0.885	0.783	0.780	4	292.442	2.42	0.000
					325			
					329			

value of 292.442 obtained from the analysis of variance, we can confidently conclude that the calculated value exceeds the critical value. This finding provides strong evidence for the significance of the regression model. Furthermore, it is noteworthy that the significance level for the test is 0.000, which is below the predetermined significance level of 0.05 set for this study.

After analyzing the data, it can be concluded that there is a notable impact, at a significance level of ($\alpha \leq 0.05$), of soft skills, including communication, teamwork, problem-solving, and time management, on organizational citizenship behavior within the Social Security Corporation. This effect is further evidenced by the dimensions of altruism, courtesy, sportsmanship, civic virtue, and conscientiousness.

According to the findings presented in Table 3, the dimensions of the soft skills variable, namely communication, teamwork, problem-solving, and time management, displayed a significant impact on the organizational citizenship behavior variable. The significance levels for these dimensions were all below 0.05, specifically (0.000, 0.000, 0.000, 0.000), and their respective t-values (4.236, 4.338, 4.660, 5.529) exceeded the tabulated t-value of 1.96. This confirms that these dimensions indeed contribute to the organizational citizenship behavior. Notably, the time management dimension had the highest Beta value of 0.275 among all the dimensions of the soft skills variable, indicating that it holds the greatest explanatory power for the dependent variable. Following closely behind is the problem-solving dimension.

Table 3 Multiple regression results for the main hypothesis

Dependent variable	Independent variable	Coefficients					
		Non-standard		Standard	Tabulated t	Calculated t	Sig level
		B	Error	Beta			
Organizational citizenship behavior	Communication	0.175	0.041	0.183	1.96	4.236	0.000
	Teamwork	0.220	0.051	0.240		4.338	0.000
	Problem-solving	0.254	0.054	0.264		4.660	0.000
	Time management	0.247	0.045	0.275		5.529	0.000

4 Discussion of Results and Recommendations

4.1 Discussion of Results

- Is there an impact of soft skills dimensions (communication, teamwork, problem-solving, and time management) on the dimensions of organizational citizenship behavior (altruism, courtesy, sportsmanship, civic virtue, and conscientiousness) in the Social Security Corporation, Jordan?

The findings of the study reveal a significant and undeniable impact of the combined dimensions of soft skills (communication, teamwork, problem-solving, and time management) on organizational citizenship behavior within the Social Security Corporation. This affirms the crucial role that soft skills dimensions play in enhancing the behavior of employees within the organization. The statistical analysis, as presented in Table 3, with an f-value of 292.442, solidifies the significant influence of the independent variable dimensions on the dependent variable dimensions, establishing a strong and positive correlation between soft skills and organizational citizenship behavior. These results indicate that by prioritizing the improvement of employees' soft skills, the organization can expect a positive impact on their behavior in terms of organizational citizenship. The soft skills dimensions account for a substantial 78.3% of the variance in organizational citizenship behavior, while the remaining percentage is attributed to unexplored factors. Additionally, the study highlights that the dimension of time management holds the highest explanatory power among the independent variable dimensions in relation to organizational citizenship behavior, followed by problem-solving, with the communication dimension having the least explanatory power.

4.2 Recommendations

Based on the results of the conducted study, several recommendations and suggestions have been derived as follows:

Recommendations for Decision Makers at the Social Security Corporation, Jordan

- Ensure an appropriate and supportive organizational environment within the institution to develop soft skills and enhance organizational citizenship behavior among employees.
- Organize awareness campaigns and share educational materials such as newsletters, articles and educational videos to increase employee awareness of the importance of soft skills and organizational citizenship behaviors.
- Senior management in the institution should adopt a policy of attracting and hiring people with advanced soft skills. Employees with strong soft skills such

as effective communication, teamwork, problem solving and time management are more likely to participate in activities beyond formal job responsibilities, contributing to an improved work environment.

Recommendations for Future Studies

- Conduct research on other dimensions of soft skills not included in this study to examine their impact on organizational citizenship behavior in the Social Security Corporation—Jordan.
- Conduct research on current research variables in other service institutions or other economic sectors in Jordan to compare the results of this study with the study populations.
- Conduct research on the relationship between soft skills and other variables such as job performance and service quality.

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Strategies for Regulatory Oversight of Foreign Technology Companies: A Comparative Study of International Experiences



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Abstract The objective of this study is to analyze the various strategies for regulatory oversight of foreign technology companies operating under corporate legislation. The study categorizes these oversight mechanisms into three main types: internal, external, and a hybrid of both. It further assesses the effectiveness of these mechanisms in achieving their intended goals and protecting national interests. Additionally, the study provides a comprehensive examination of the legal provisions related to oversight and conducts a comparative analysis of regulatory practices in different countries. Based on this analysis, the study offers recommendations to enhance existing oversight systems, aiming to strike a harmonious balance between safeguarding national interests and leveraging the expertise and investments of foreign technology companies.

Keywords Corporate oversight · Foreign technology companies · Corporate laws · Internal oversight · External oversight · Mixed oversight · Legal regulations

1 Introduction

To ensure fair and transparent practices among foreign companies operating in a particular country, it is crucial to establish a comprehensive set of rules and regulations that govern their activities from the moment they set foot on the host country's territory until their eventual closure and removal from the official company registry. This oversight is necessary to uphold principles of justice and equality for all stakeholders involved, including capital investors and third parties [1].

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The state's authority over foreign corporations, derived from its legal jurisdiction and responsibility for its land and citizens, is also a result of the legal and economic significance of these corporations. The oversight of foreign corporations has progressed from a solely restrictive function, centered on identifying legal and administrative gaps and enforcing additional regulations on their operations, to a more proactive role that guides their activities to guarantee their contribution to the state's economic development [2].

To prevent any deviation from the intended goals of granting licenses to foreign companies, the state is now tasked with monitoring different facets of economic activity within its jurisdiction. This responsibility is crucial in order to safeguard the public interest and promote the growth of the national economy. It is important to prioritize these objectives rather than solely focusing on profit without any form of regulation or limitations [3].

In order to uphold national security and prevent foreign companies from overpowering the domestic economy and marginalizing local businesses and capital, it is crucial for the state to strike a balance between the advantages these companies bring, such as capital infusion, job creation, expertise, and modern technology, and the need for effective and suitable legal oversight. Thus, the level of oversight imposed on foreign companies may differ from country to country, ranging from minimal regulation to rigorous measures, and in some cases, even prohibiting these companies from operating within its borders [4]. The state must ensure that it can benefit from the presence of these companies while safeguarding its own interests.

In order to ensure the desired economic development and protect all parties involved, state oversight of foreign companies should be proactive rather than arbitrary. This oversight serves to guide the activities of these companies in accordance with national economic plans, while also safeguarding partners and third parties who engage with the company under potentially weaker legal circumstances [4]. The obligation of state oversight extends throughout the entire lifespan of the foreign company, from its establishment to its dissolution and liquidation. This ongoing oversight has significant implications for both the state and the company. The state, exercising its sovereignty over its territory, cannot relinquish or delegate its oversight responsibilities. Meanwhile, the company is bound by these regulations, requiring its partners and third parties to adhere to its rules and regulations [5].

The regulatory oversight of companies can occur either before or after their establishment, depending on when the registration procedures outlined in Jordanian company law are completed. These two forms of oversight work together and are determined by the completion of the establishment procedures. Prior oversight takes place during the establishment process, while subsequent oversight occurs after the registration procedures are finished and continues during the company's operations. Prior oversight is conducted externally by the home country of the main company, whereas subsequent oversight can be both external, carried out by the home country, and internal, conducted by the host country within its own jurisdiction [6].

1.1 Study Objectives

This study aims to:

1. Identify the types of regulatory oversight imposed on foreign companies operating in Jordan by analyzing legal texts on internal, external and mixed oversight.
2. Assess the effectiveness of current oversight in achieving intended goals and protecting national interests.
3. Analyze legal texts regarding the oversight of foreign companies.
4. Make recommendations to increase the effectiveness of oversight and balance national interests with the benefits of foreign companies.
5. Analyze and compare the regulatory oversight imposed on foreign companies in other countries to benefit from international experience and improve local regulations.

1.2 Study Methodology

In order to examine and assess the various forms of oversight placed upon foreign companies in Jordan, a descriptive-analytical methodology was utilized in this study. Legal resources, such as Jordanian Companies Law No. 22 of 1997 and its accompanying executive regulations, along with previous research and studies, were gathered to obtain relevant data. To collect this data, techniques such as analyzing legal texts and reviewing literature and previous studies were employed. It is important to note that this study specifically concentrated on the legislation within Jordan, which may restrict the applicability of the findings to other countries with distinct regulatory frameworks.

2 Concept of Oversight on Foreign Companies and Its Objectives

From the beginning, it is important to note that there is no singular law that explicitly outlines the concept of oversight. However, the researcher proposes a comprehensive definition for oversight in relation to foreign companies. According to their analysis, oversight can be understood as a collection of legal regulations and administrative protocols that enable the government to effectively monitor and guide the operations of foreign companies. The ultimate goal of this oversight is to facilitate economic development and safeguard the interests of the company's partners and other stakeholders, both during the establishment phase and throughout subsequent stages of its operations [3, 7].

The primary objective of the state's oversight over foreign companies is twofold: safeguarding the national economy and ensuring the protection of partners, shareholders, and third parties involved in transactions with the company. In addition, the definition elucidates the various approaches employed by the state to exercise this oversight, encompassing legal regulations and administrative procedures. It emphasizes the compulsory nature of this oversight, which entails monitoring and guiding the operations of foreign companies to foster economic advancement throughout their existence. This regulatory process adheres to meticulously planned and distinct legal measures.

The process of overseeing companies involves a series of scientifically researched and interconnected steps that work together to accomplish a specific objective, as mentioned earlier. If any of these steps were to fail, the entire oversight process would be compromised, leading to inefficiency and ineffectiveness. The purpose of implementing oversight measures on foreign companies is to guarantee their adherence to regulations, prevent company failure, and safeguard the interests of partners and third parties involved in business transactions with the company.

Upon closer inspection of the regulations imposed on foreign companies, it becomes evident that their purpose is twofold: to safeguard the interests of the state and to ensure the well-being of the company, its affiliates, and external entities. As a result, these regulations strive to accomplish a multitude of objectives, spanning economic, legal, political, social, and environmental realms. However, it is important to note that while these oversight measures have yielded commendable outcomes, they have not been exempt from criticism. Detractors argue that they complicate procedures and impose unnecessary restrictions on foreign companies, potentially impeding their ability to contribute to the growth of the national economy.

The necessity of regulating foreign companies is rooted in the state's authority over all individuals and entities within its borders, as well as the crucial role these companies play in bolstering the national economy and addressing unemployment concerns. Additionally, oversight ensures the protection of those involved in transactions with these companies. However, it is essential that this oversight is conducted in a balanced and well-informed manner, taking into account the interests of both the host state and the foreign companies. The host state benefits from the presence of these companies, as they bring practical and scientific expertise, capital, and technology. Meanwhile, foreign companies seek financial gains and the establishment of a strong commercial reputation on regional and global scales.

2.1 Objectives of Oversight on Companies

Achieving the Public Interest

When it comes to the interests of the public versus private entities, the state consistently gives priority to the former. This applies to both natural individuals and legal entities. The state must strike a balance between the advantages that foreign

companies bring to its territory and the need to maintain security, stability, protect local businesses, talents, and labor. In order to achieve this, foreign companies are required to obtain the necessary licenses from relevant authorities and adhere to registration procedures outlined in the Jordanian Companies Law. The Regulatory Official of Companies has the authority to accept or reject company registration without providing an explanation. This process aims to gain an understanding of the company's operations, assess their potential impact on national security and stability, and determine if they may overshadow national companies due to their capital, equipment, and expertise. Furthermore, the state takes into account the positive effects and benefits that these companies can bring, such as contributing to national economic growth and addressing issues of poverty and unemployment [8].

Protecting the National Economy and Economic Development Plan

The primary objective of regulating foreign companies is to provide guidance and safeguard the national economy, while also supporting the economic development plan. To achieve these aims, countries oversee the activities of these companies. This oversight ensures that the projects undertaken by foreign companies do not contradict the public interest or violate public order and morals. Companies whose objectives do not align with national interests are excluded and denied licenses. Additionally, this oversight protects domestic industries by refusing licenses to foreign companies that pose a threat to these industries. States direct the activities of these companies towards cities that are in greater need of development, which in turn benefits the industrial and service sectors in those areas. This approach aids in the selection of suitable economic projects, channels capital towards these cities, and contributes to economic growth and job creation. As a result, there is an increase in exports and a controlled approach to imports [9].

Ensuring Compliance with Legal Provisions

The main goal of overseeing foreign companies is to guarantee their adherence to the regulations outlined in the Jordanian Companies Law and related provisions, while also enforcing suitable penalties for any infractions that may occur during the company's existence [10].

Protecting Partners and Shareholders

The company's commitment to safeguarding its partners and shareholders is demonstrated through the guarantee that they will receive their designated portion of profits as outlined in the contractual agreement. Any agreements that strip partners of their rightful financial or non-financial gains are deemed null and void, as they undermine the integrity of the company's contract. Additionally, certain regulations prohibit the distribution of fabricated profits, as this can diminish the company's capital and have detrimental effects on shareholders [11].

Environmental and Social Objectives

Business owners and investors commonly prefer to establish their commercial ventures in capital cities or large urban centers. This preference stems from the availability of services and a diverse workforce consisting of laborers, technicians, and administrators. However, this concentration of businesses in one area leads to problems such as traffic congestion and high population density. The influx of employees working for these companies contributes to these issues. Moreover, the clustering of industries in a single location can result in environmental pollution caused by factory waste and emissions, which in turn can have detrimental effects on the health of residents. Additionally, this practice deprives other cities of the opportunity to benefit from the services provided by these companies. Therefore, it is the responsibility of the government to ensure fairness and equality by distributing companies across different cities. This approach not only addresses unemployment but also maximizes the benefits derived from these businesses [12].

Consequently, the purpose of state oversight is to safeguard the interests and rights of third parties involved with the company, through the implementation of restrictions and procedures on founders and managers. This ensures that they are obligated to provide compensation in the event of any harm caused [13].

3 Types of Oversight on Foreign Companies

From the inception of foreign companies to their eventual dissolution and liquidation, a range of oversight measures are imposed. The state, in accordance with legal provisions, delegates administrative bodies to ensure a fair equilibrium among the interests of all involved parties.

Chapter Twelve of the Jordanian Companies Law No. 22 of 1997 does not specifically cover oversight on foreign companies, which means that Chapter Fourteen of the same law, which addresses oversight on companies in general, must be consulted. Articles 273–276 grant the minister and the Regulatory Official of Companies the power to exercise this oversight. As a result, this section will examine and analyze these provisions in order to understand the various forms of oversight imposed on foreign companies.

3.1 Internal Oversight

Internal oversight, as defined in the context of a foreign company, is the implementation of oversight measures by the host state from within the company. This can be executed by various entities within the company, including the board of directors, partners, managers, or shareholders. Internal auditors may also play a role in conducting this oversight. The effectiveness and efficiency of internal oversight are

crucial in ensuring that the company attains its desired objectives. States often enforce internal oversight as a means to safeguard their national interests. An illustration of internal oversight can be found in Article 274(a) of the Jordanian Companies Law No. 22 of 1997.

Partners and shareholders are afforded certain rights under Article 274(a) of the Jordanian Companies Law No. 22 of 1997. This provision allows them access to information and documents pertaining to the company that are both published and maintained by the auditor. Additionally, they are entitled to receive a certified copy of these documents, subject to the auditor's approval. However, if the documents and data are not yet published, access can only be obtained through a court order and by paying the prescribed fees as stipulated by the law. Therefore, the legislature treats partners and shareholders as third parties [14].

Despite the effectiveness of this type of oversight on foreign companies, it can be limited in some cases due to the following reasons:

1. Foreign companies often prefer full ownership and reject the participation of domestic capital, seeking countries that grant them this right without requiring the participation of national capital.
2. When foreign companies allow the participation of domestic capital, the capital is distributed among many shareholders who are primarily interested in the profits and financial gains of these companies, without playing an active and positive role in supervising the companies.

In order to enhance the efficiency of internal oversight over foreign companies, it is advisable for states to mandate national capital participation, with national capital accounting for no less than 51% of the company's total capital. In cases where there are multiple national shareholders, none should hold a stake that is less than one-third of the total shares. Furthermore, it is crucial that these national shareholders possess the requisite administrative and technical knowledge. By implementing these measures, it can be ensured that foreign companies do not exert excessive control over the company, thereby bolstering internal oversight, safeguarding national interests, and protecting the rights of shareholders and third parties [15].

3.2 External Oversight

The concept of external oversight pertains to the legal oversight carried out by external entities on a company to ensure adherence to the procedures outlined in the Jordanian Companies Law. The authority to exercise this oversight was granted to the minister and the General Supervisor of Companies by Article 273 of the Jordanian Companies Law No. 22 of 1997. This article stipulates that all companies are obligated to comply with the provisions of the law, their founding contracts, articles of association, and decisions made by their general assemblies. The minister and the supervisor are empowered to take necessary actions in order to monitor companies

and verify their compliance with these provisions, contracts, systems, and decisions [16, 17]. Specifically, the oversight entails:

1. Reviewing the financial statements and documentation of the company.
2. Verifying that the company maintains compliance with its intended objectives.

The legislator's oversight of the company is primarily focused on reviewing its financial accounts and records and ensuring compliance with its stated objectives. However, there is concern that the company's own preparation of these account statements may hinder the detection of errors or manipulations, particularly if the company employs skilled and capable accountants.

Article 243 of the Jordanian Companies Law No. 22 of 1997 ensures external oversight by requiring foreign companies to present their yearly financial statements, which need to be certified by a Jordanian auditor [18–23]. The appointed supervisor or their representative is granted the authority to examine the company's books and records, and the company is obligated to furnish these materials upon request.

Article 274(b) of the Jordanian Companies Law No. 22 of 1997 outlines an additional means of external oversight. This article bestows upon individuals the privilege of accessing information exclusively pertaining to registered companies. However, acquiring the company's file from the supervisor or obtaining a certified copy necessitates court involvement and payment of the designated fees, all while being monitored by the supervisor [24].

In its decision, the Jordanian Court of Cassation has implemented external oversight on companies, as evidenced by the following statement: "In light of the appeal's argument regarding the Court of Appeal's errors, which resulted in a ruling that contradicts a specific legal provision that does not permit any alternative interpretation or explanation. The appellant relied on Article 274(a) of the Jordanian Companies Law No. 22 of 1997 in their request, which designates the Department of Companies Control as the competent authority for issuing documents, subject to the regulatory official's approval" [25].

According to the researcher, external oversight of foreign companies proves to be more advantageous and efficient compared to internal oversight [26–28]. This is because external oversight is carried out by individuals who are not directly affiliated with the company and possess legal authority. Their primary objective is to monitor the company's activities and ensure compliance with legal requirements, safeguarding the interests of the public as well as shareholders, partners, and other stakeholders. This oversight remains in effect throughout the entire lifespan of the company, spanning from its inception to its eventual dissolution and liquidation [29].

3.3 Mixed Oversight

The effectiveness and influence of oversight, whether internal or external, can be severely hindered by the tactics employed by foreign companies to evade such scrutiny. As a result, it has become imperative to merge both internal oversight,

consisting of partners [30, 31], shareholders, managers, and auditors, with external oversight, represented by the minister and the supervisor. The ultimate objective of this combined oversight is to safeguard the public interests of the host country.

To achieve the goal of oversight without hindering the operations of foreign companies, it is crucial to combine internal oversight from within the company with external oversight from authorized entities. The state must strike a balance between its national interests and the advantages offered by these companies in terms of expertise, resources, and investment, all while ensuring security and stability [32].

In terms of the position taken by the Egyptian legislator, it is evident that a combination of internal and external measures have been implemented to ensure oversight of foreign companies. In terms of internal oversight, these companies are obligated to keep commercial records, register with the commercial registry, and adhere to profit tax regulations. This requirement is clearly stated in Article 311 of the executive regulations of the Egyptian Companies Law, which specifies that "foreign company branches operating in Egypt must appoint an auditor who meets the qualifications required for auditors of joint-stock companies [33–35]." To oversee the activities of foreign company branches in Egypt and gain access to their records and documents, the Minister of Justice, in collaboration with the Minister of Economy, appoints individuals who are granted the status of judicial officers. It is the responsibility of the company manager to facilitate their work, while abiding by legal obligations [36].

In terms of external oversight, the Egyptian legislature mandates that foreign companies operating in Egypt must disclose the name of their parent company and provide all relevant information at their local offices, as stated in Article 310 of the executive regulations. This article specifies that the General Administration of Companies maintains a dedicated register for branches of foreign companies in Egypt, which includes details such as the parent company's name, headquarters, purpose, the branch's address in Egypt, its activities, registration date, number, and other related data [16, 37–39]. Additionally, the legislator has granted the General Administration of Companies the authority to conduct inspections of foreign company branches in Egypt, examine their financial records, and request any necessary clarifications or documents, as outlined in Article 315 of the executive regulations. According to this article, the General Administration of Companies is empowered to ensure compliance with the law and the aforementioned regulations by conducting inspections and reviewing financial records. Furthermore, it has the right to request any additional information or documents that may be required for this purpose [17].

The researcher asserts that a combination of internal and external oversight is the optimal approach, as relying solely on one type may prove ineffective in achieving oversight objectives. Internal oversight, conducted by partners, managers, shareholders, and auditors within the company, has its limitations and may fall short of the desired outcomes. Similarly, external oversight alone is deemed insufficient in attaining its goals [19]. Therefore, a harmonious integration of both methods becomes essential, as they mutually reinforce each other. Internal oversight ensures accountability within the company, while external oversight is enforced by specialized administrative bodies empowered by law, led by the minister and the regulatory

official. Companies are obligated to collaborate with and facilitate their work, ultimately fulfilling the purpose of oversight, which is safeguarding the public interest and protecting the rights of shareholders, partners, and third parties [20].

In the researcher's perspective, foreign companies should face consequences if they are discovered to be in violation of legal regulations due to oversight or deliberate attempts to evade oversight. These consequences might include monetary fines, the revocation of privileges and exemptions, or even the cancellation of company registration.

4 Conclusion

To guarantee adherence to the laws and regulations of a host country and maintain a balance between the interests of foreign companies and national interests, overseeing the operations of foreign companies is essential. This oversight can take two forms: internal oversight, which is conducted by the board of directors and shareholders within the company, and external oversight, which is carried out by external authorities like the minister and the general supervisor of companies. Extensive research has confirmed the existence of these two types of oversight and their varying degrees of implementation.

4.1 Results

1. By implementing laws and administrative procedures, the oversight of foreign companies guarantees the safeguarding of the national economy, as well as the protection of the interests of shareholders and third parties, all while ensuring that these companies comply with the economic objectives of the state.
2. The vital task of ensuring compliance with laws and regulations by foreign companies is accomplished through two types of oversight: internal and external. Internal oversight involves oversight from within the company, while external oversight ensures adherence to laws through external entities.
3. The goals of foreign company oversight encompass safeguarding the national economy, promoting economic development initiatives, enforcing legal provisions, safeguarding partners and shareholders, and attaining environmental and social objectives.
4. The examination brought attention to the difficulties encountered in overseeing foreign companies, including the issue of foreign companies' autonomy in terms of capital and their reluctance to involve national capital, as well as the scattering of capital among numerous shareholders without a meaningful role in oversight.

4.2 Recommendations

1. To guarantee national capital involvement in foreign companies, host countries should establish regulations mandating a minimum of 51% ownership by national shareholders, on the condition that they possess the necessary competence and experience in administrative and technical matters.
2. To ensure the continuous and effective oversight of companies, it is imperative to strengthen the powers of external oversight entities, such as the minister and the general regulatory official of companies, while also providing them with the necessary support.
3. In order to achieve the mutual interest of both the host country and foreign companies, it is crucial to establish well-considered oversight policies that strike a balance between the host country's desire for benefits and the foreign companies' pursuit of profits.
4. In order to adapt to economic and technological advancements, as well as to improve oversight effectiveness and accomplish desired objectives, it is crucial to update and develop legislative and regulatory frameworks pertaining to the oversight of foreign companies.
5. Foreign companies that are found to be in violation of laws and regulations should face strict penalties, which may include fines, denial of privileges, and, in severe cases, deregistration of the company.
6. To enhance the implementation of effective oversight measures for foreign companies, it is crucial to foster stronger collaboration between host countries and international companies, promoting the exchange of successful experiences and practices in this domain.
7. To ensure the effective implementation of oversight procedures, it is crucial to offer awareness and training programs to partners, shareholders, and oversight entities. These programs will not only raise awareness about the significance of internal and external oversight but also enhance their skills in applying such procedures.

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Forensic Framework for Deleted Media of WhatsApp on Windows



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Abstract WhatsApp is one of the most important apps that lets us transmit text, audio, and multimedia files as well as have voice and video chats online in this day and age where everything is going digital. It was established by Facebook Inc. in 2009 alongside Brain Acton and Jan Koum and received it in 2014. It is gaining popularity because of its ease of use, cross-platform interoperability (available for Android, iOS, and web browsers), end-to-end message encryption, and the ability to use phone numbers as unique identification. This application enables users to start individual or group discussions, share their present location, and alter their status. Although the increasing usage of WhatsApp as a social media platform elevates the potential of becoming a crime target, there are just a few articles on the forensic examination of WhatsApp, and they are mostly focused on this mobile-only service. In

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this paper, we suggested a comprehensive forensic analysis framework for Windows-based WhatsApp lost media. While it is not feasible to evaluate every feature this application offers, our forensic investigation approach concentrates on erased material. We considered conducting an evaluative case study using the WhatsApp application, which is available on the Windows platform. For this case study, we created a crime scenario in an experimental setting, followed by an overview of a forensic methodology and technical solutions for deleted media, scientific and technological progress.

Keywords WhatsApp · Digital forensics · Comprehensive framework · Criminal investigation · Recovery of deleted media · Windows OS

1 Introduction

In today's world, WhatsApp has become an essential communication tool, leaving a trail of data in its wake. This wealth of knowledge, however, is not limited to casual talks. In the world of investigations and judicial actions, WhatsApp forensics appears as a significant tool for discovering critical evidence. For example, consider the following scenarios such as a missing case in which the last known communication was a WhatsApp chat, a fraud investigation in which financial transactions were conducted via the app or a cyberbullying case in which injurious chat must be traced and documented.

In WhatsApp forensics, investigators analyze text messages, multimedia, contacts, locations, and metadata to reconstruct events and gather evidence. This process involves various digital forensic domains: computer forensics [1], mobile forensics [2], Android and iOS forensics, cloud forensics [3], network forensics [4], and memory forensics [5]. These methods are critical in supporting investigations and legal proceedings. Additionally, the field of digital forensics continues to expand, encompassing areas like social media, IoT, drone, and blockchain forensics, reflecting its adaptability to evolving technologies and investigative needs.

1.1 Introduction to the WhatsApp

Meta Platforms owns WhatsApp, a widely-used messaging and voice-over-IP (VoIP) service with over 2 billion users globally, available on both PCs and mobile devices. Originally created for friends and family to stay connected, WhatsApp quickly gained popularity and was acquired by Facebook in 2014 for $19 billion. According to a blog post by Dean [6], WhatsApp is the world's most popular messaging service, with around 100 billion messages sent daily. India leads with the largest number of users, approximately 487.5 million as of June 2021.

WhatsApp is available on various platforms, including iOS, Linux, Mac, and Windows. WhatsApp for Windows was first introduced on May 10, 2016, and later updated in 2023 to a version built on the Universal Windows Platform (UWP), enhancing functionality and stability. The Windows version of WhatsApp organizes its essential files and folders, including archived, index, and media files, in a specific folder hierarchy to ensure smooth and secure operation.

In Windows, 5319275A.WhatsAppDesktop_cv1g1gvanyjgm is the main folder dedicated to WhatsApp, and it contains additional folders such as AC, AppData, LocalCatch, LocalState, RoamingState, Settings, SystemAppData, and TempState, as shown in Fig. 1. These are formed for various tasks required to efficiently operate WhatsApp.

Our major investigation folder is LocalState, which contains a variety of folders and files, including database files, DB-SHM files, DB-WAL files, DAT files, storage files, and text documentation, shown in Fig. 2.

WhatsApp uses shared Fig. 3 folder that is inside the LocalState folder to store images, videos, documents, stickers, audio recordings, GIFs, location data, voicemail messages, payment messages, and other documents. They used to store such media weak wise within this folder, signaling that they were saved in a separate location.

In rotatedLogs folder that is within the LocalState folder, it has three log files by default. These are the daily logs generated by WhatsApp Desktop and saved in the rotating log folder, which is a circular buffer containing information about the application's operations such as errors, warnings, and general usage data. These

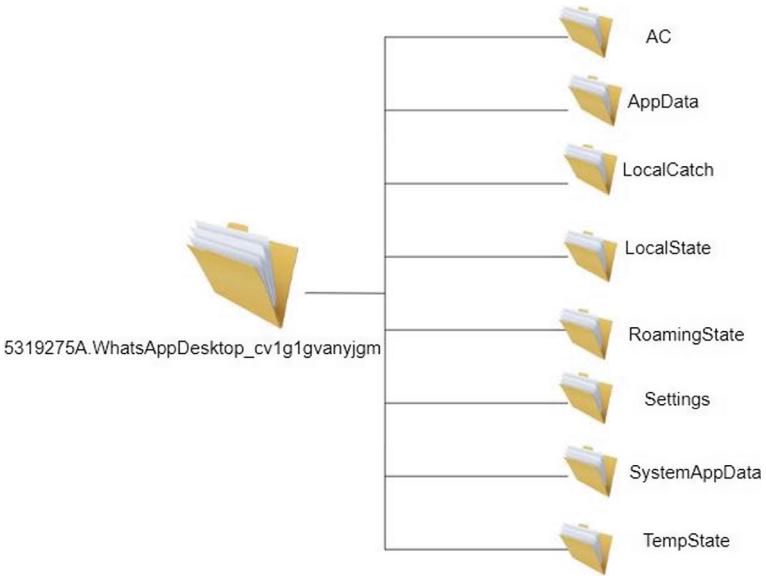


Fig. 1 WhatsApp folder in windows

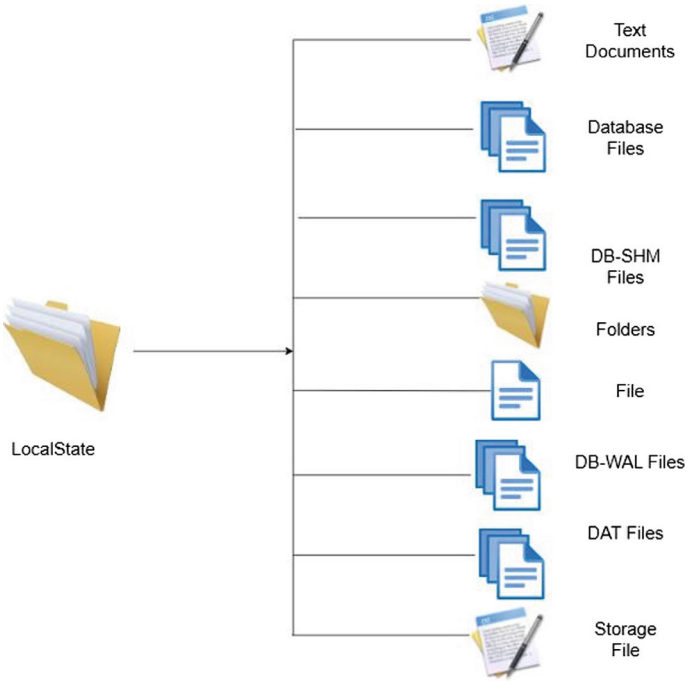


Fig. 2 WhatsApp investigative folder in windows

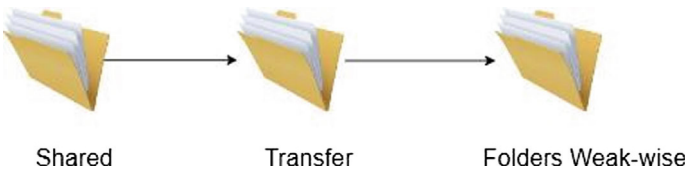


Fig. 3 WhatsApp media storage folder in windows platform

logs used to contain a variety of data, including application starting and shutdown, network activities, user interactions, error messages.

2 Literature Survey

Several forensic frameworks for WhatsApp have been proposed in recent years, each focusing on different aspects of digital evidence extraction and analysis. Actoriano and Riadi [7] proposed an integrated forensic framework for WhatsApp Web, which provides guidelines for obtaining and analyzing digital evidence stored on laptops or smartphones. Utomo et al. [8] conducted forensic analysis of WhatsApp browsers,

extracting and analyzing conversation artifacts and media data, noting significant differences in the latest WhatsApp versions. Vukadinović [9] explored forensic analysis of artifacts from web and desktop clients on Mac and Windows platforms, with research suggesting that IndexedDB technology can be a valuable source of digital evidence [10].

Owda and colleagues [11] developed a method to decrypt WhatsApp databases on Android devices without rooting, while Alhidaifi [12] conducted a comparative analysis of various WhatsApp forensic tools like WhatsApp Xtract and WhatsApp Viewer. Other studies, like those by Olaniyi [13], focused on data security and user vulnerability, while Ramraj and Usha [14] investigated the privacy and encryption features of WhatsApp Web.

Rastogi and Hendler [15] analyzed the cryptography protocols securing WhatsApp, and Johari et al. [16] explored vulnerabilities that could compromise user data. Koppolu [17] provided a deep-dive analysis of WhatsApp artifacts relevant in crime investigations, while Khweiled and Jazzar [18] proposed an enhanced NIST framework for investigating cyberbullying. Dangar [19] and John Alhassan Abubakar et al. [20] further developed forensic processes for recovering WhatsApp data from Android devices. Finally, Anglano [21] conducted controlled studies on WhatsApp interactions, using the NIST method to gather evidence from Android smartphones as explored by Ramadhan and Riadi [22, 23–26].

This studies make significant contributions to the evolving field of WhatsApp forensics, presenting diverse methodologies and tools for the extraction and analysis of digital evidence. After conducting a thorough review, we found that numerous forensic analyses and frameworks have been developed for WhatsApp on mobile platforms and web browsers. However, there remains a notable gap in forensic research and tools specifically targeting the Windows desktop version of WhatsApp.

3 Proposed Framework for the Deleted Media WhatsApp on Windows

Several digital frameworks have been published in the past. Pollitt offered a four-phase framework: acquisition, identification, evaluation, and admittance. Palmer developed a six-phase paradigm for digital forensic investigation, including identification, preservation, collection, examination, analysis, presentation, and decision. Martini and Choo developed a four-phase digital forensic methodology for cloud computing, which includes evidence source identification, analysis, reporting, and presentation. These general digital forensic frameworks serve as the foundation for digital procedures for new services or devices. However, there is no forensic framework for specific applications. In addition, we need a certain framework within which to concentrate our analysis of social media apps like WhatsApp. There are a few studies on WhatsApp's forensic architecture; however, they are mostly for this

application, which is for mobile versions, rather than WhatsApp, which is available on Windows. In this research, we proposed a comprehensive forensic for WhatsApp on Windows which is presented in Fig. 5.

There are five steps in our suggested framework:

Phase 1: Evidence Collection

Phase 1 is the evidence-collection phase, during which all evidence is gathered from all sites where WhatsApp is used to store data on Windows. It includes data from WhatsApp-specific directories, as well as registry and log files.

Phase 2: Evidence Preservation

Phase 2 is evidence preservation, which involves preserving the data collected during the evidence collection phase. It entails converting the bit image of the evidence and then encrypting it by establishing a password on the bit image files themselves to provide additional security. For this, we use the FTK image tool to create the bit image file as well as encrypt and decrypt it.

Phase 3: Data Extraction

Phase 3 is the data extraction phase, during which we extracted data from deleted messaging, configuration files, and destroyed media. We extracted the material using the Autopsy tool.

Phase 4: Analysis

Phase 4 is the analysis phase, in which we examine the deleted media and messages, which include deleted documents, movies, stickers, gif pictures, photographs, and deleted messages extracted during the data extraction phase.

Phase 5: Report Generation

Phase 5 is the report generation phase, the investigator reports and presents the results of the examination and analysis in a legally acceptable manner.

4 Related Work

WhatsApp is primarily used for communication, which includes voice calls over the Internet, text and audio messaging, multimedia files, and message sending and receiving. However, as the popularity of this program as a social media platform rises, so do crimes and threats, such as security events and attacks over the years, such as security flaws. WhatsApp, like any other software, contains security issues. When these vulnerabilities are exploited, attackers may be able to jeopardize user security and privacy. In 2019, for example, WhatsApp announced a security incident involving the exploitation of an app vulnerability that allowed attackers to remotely

install the Pegasus spyware on user devices, which was produced by the Israeli business NSO Group and has advanced monitoring capabilities. Phishing attacks pose another significant threat to all online systems, including WhatsApp. In this situation, the user receives messages or emails claiming to be from WhatsApp, seeking sensitive information or directing them to click on harmful links. Despite not being a typical "attack," WhatsApp saw a significant reaction in 2021 due to changes to its privacy policies. There has been an increase in people searching for alternative messaging platforms due to concerns raised about expanded data sharing with Facebook. So, with these considerations in mind, we applied our proposed architecture to the Windows Platform's WhatsApp and created a comprehensive forensic investigation framework based on it, as shown in Fig. 5.

To assess the suggested framework, we developed a realistic environment and an experimental-case scenario. Using this, we describe technical forensic investigation methodologies and procedures for WhatsApp, as well as an overall evaluation of the suggested framework [27–30].

5 Experiment Case Scenario and Environment

The experimental case scenario is a forensic case involving fraud media and messages delivered to a victim by a fraudster and later deleted by the victim or another person using Windows WhatsApp. The investigator should gather the following information for an example acquiring the information timestamp when the application has been used, Crash information for the application, Media were deleted.

The experimental environment includes an installed version of Windows' WhatsApp, which the fraudster used to conduct a crime, as well as an Autopsy tool for recovering the missing evidence. We collected such deleted evidence utilizing several online open-source apps, such as Autopsy. We also deleted one of the media for an experiment on recovering deleted WhatsApp data via Autopsy. As a result, the Autopsy program serves as a testing environment for retrieving deleted media files from WhatsApp (Table 1).

We have focused on the technical investigation method and procedure and assume that the proper authority has been obtained to access the victim's application.

Table 1 The experimental environment

Category	System
Operating system	Windows
Experimented app	WhatsApp
Experimental environment	Autopsy for media analysis, FTK image for creating bit image of evidence and for encryption and decryption

5.1 Evidence Collection

During this phase, the investigator collected information from every possible location where WhatsApp could store it. The investigator used Windows registry to get the information about the WhatsApp.

The investigator also used the WhatsApp logs to gather information about the WhatsApp application, such as when it was launched on the suspected days and how long victims spent in the operational application. As seen in Fig. 6, And WhatsApp uses the following logs to store log data: applog.txt.202401152055, applog.txt.202401162353, applog.txt.202401172047, applog.txt.

The rotatedLogs folder contains three log files by default. These are the daily logs that WhatsApp Desktop creates and stores in the rotating log folder. The rotating log folder is a circular buffer that holds data on how the application functions, including warnings and problems. The applog.txt log file is present inside the LocalState folder and contains general information regarding WhatsApp Desktop application behavior, including media and messages (Figs. 7 and 8).

WhatsApp version information, including the version the victim was using, and the crash report of WhatsApp from the Microsoft.AppCenter.Storage, and these data can be accessed from the version file contained within the LocalState folder (Fig. 9).

WhatsApp is used to allocate a specific folder for media, known as the shared folder, as shown in Fig. 4. Inside this folder, there is another folder called the transfer folder, and if we go inside, WhatsApp is used to store its material in weak-wise order, as shown in Fig. 10.

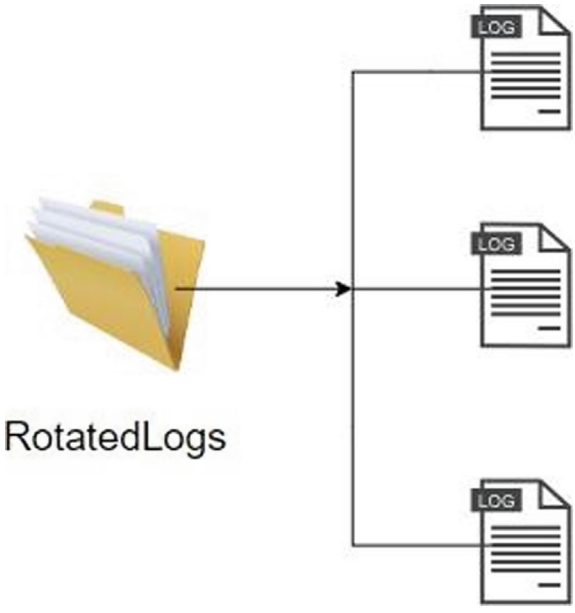


Fig. 4 WhatsApp logs folder in windows platform

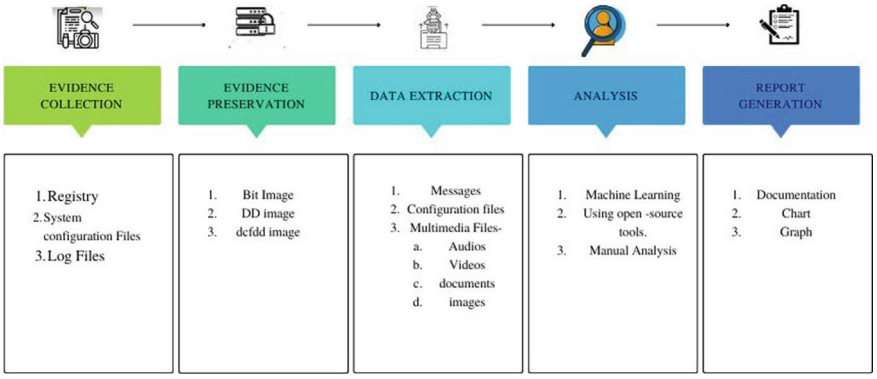


Fig. 5 Forensic investigation framework for the WhatsApp on windows platform

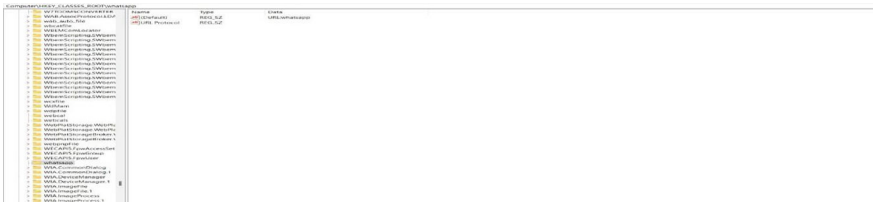


Fig. 6 Evidence collection from windows registry

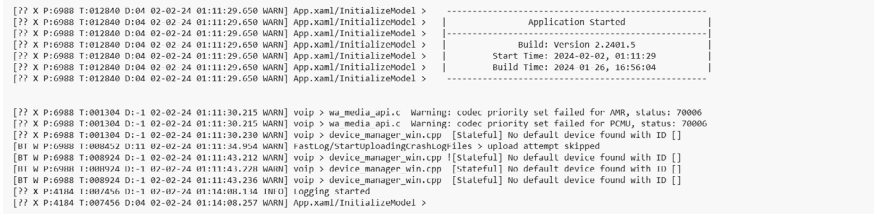


Fig. 7 WhatsApp logs analysis (rotatedLogs)



Fig. 8 WhatsApp logs analysis (applog.txt)

```
□9□ □□□core{
  "services": [
    "Crashes"
  ],
  "timestamp": "2024-02-05T07:07:48.2272674Z",
  "device": {
    "sdkName": "appcenter.uwp",
    "sdkVersion": "5.0.1",
    "model": "HP Laptop 15s-du1xxx",
    "oemName": "HP",
    "osName": "WINDOWS",
    "osVersion": "10.0.22621",
    "osBuild": "10.0.22621.3007",
    "locale": "en-US",
    "timeZoneOffset": 330,
    "appVersion": "2.2401.5.0",
    "appBuild": "2.2401.5.0",
    "appNamespace": "5319275A.WhatsAppDesktop"
  },
  "type": "startService"
}
```


Fig. 9 WhatsApp Microsoft.AppCenter.Storage analysis

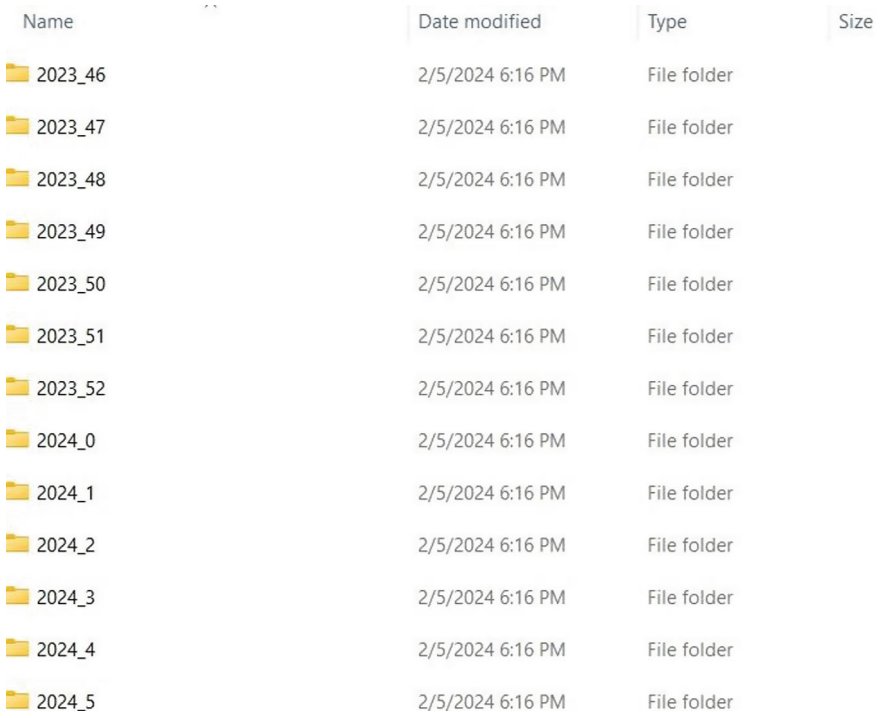


Fig. 10 WhatsApp media folder

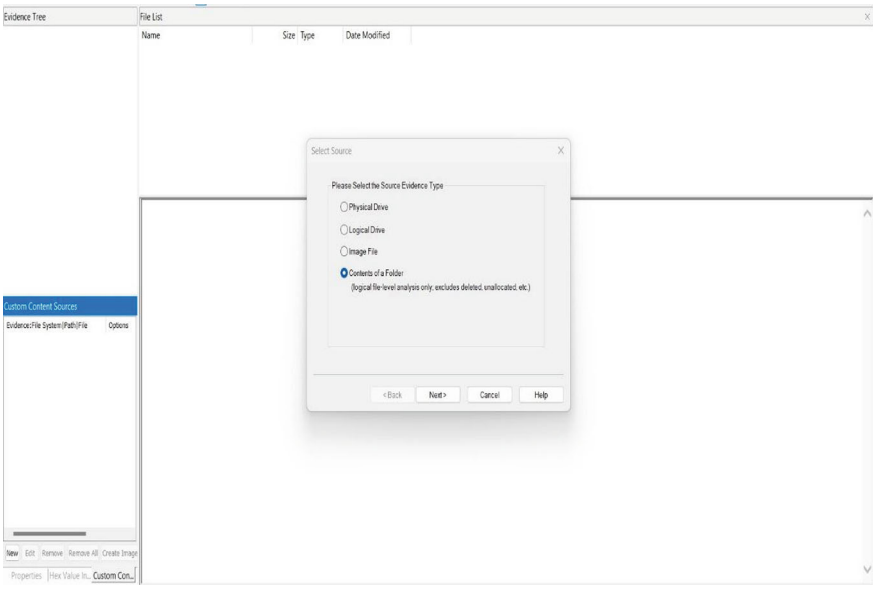


Fig. 11 Choosing selection source FTK image

5.2 Evidence Preservation

In this phase, we preserved the WhatsApp main folder by generating a bit image with the FTK Image tool and then encrypting it with the application by offering a password so that no one could change it before analysis. Here are the screenshots of the process and by following these steps we preserved the evidences (Figs. 11, 12, 13, 14, 15, 16, 17, 18, 19).

5.3 Data Extraction

In this phase, we extracted the data that needed analysis. As our research area is about deleted media and messages, after the decryption of the preserved evidence, we mainly focused on the shared, which is particularly located for media storage folder, which is for storing the messages.

5.3.1 Recovering the Non-Deleted Media

To retrieve non-deleted media, simply navigate to the particular folder in the Windows directory, where we can see all forms of media in a non-encrypted format, ordered in weak-wise order, which depicted in Fig. 10.

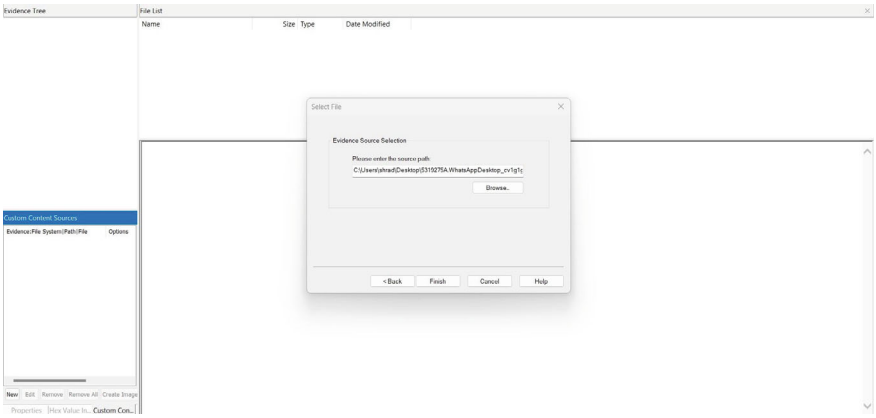


Fig. 12 Specifying the source path

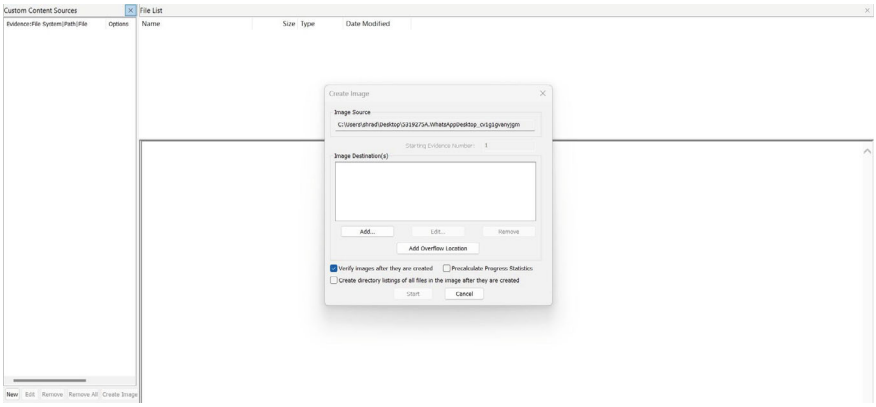


Fig. 13 Adding the destination path

5.3.2 Recovering the Deleted Media

To recover the deleted media, investigators have used the Autopsy open-source software. WhatsApp used to store the data as weak-wise, so the investigator figured out which weeks were suspected, and according to that, he or she extracted the data by using this tool. For the crime scenarios, we assumed that the first week of February 2024, as shown in Fig. 10, was the suspected week, so we recovered all the deleted media that were deleted in that week. We found that media got deleted this particular week, and we saved these media in a saved location for analysis purposes. These deleted media are.

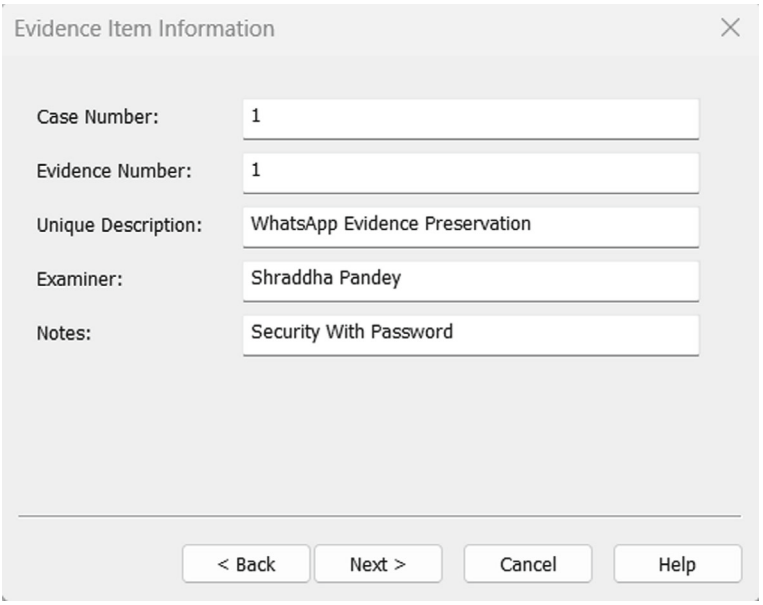


Fig. 14 Image item information

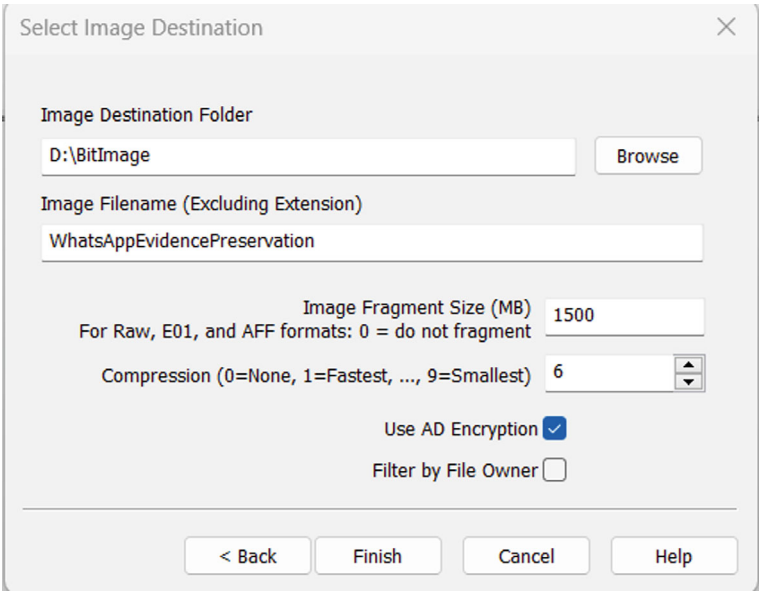


Fig. 15 Select image destination

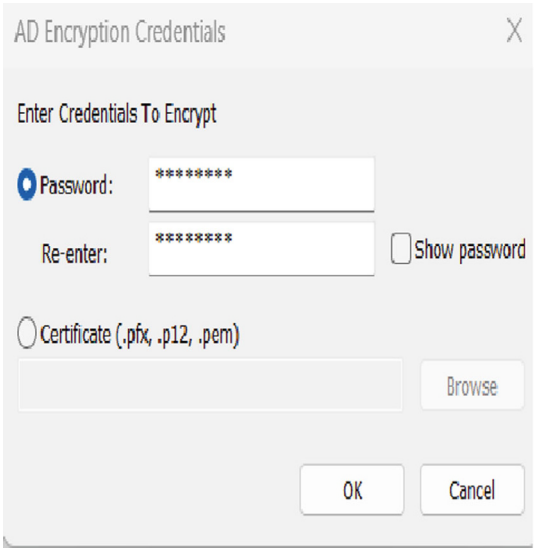


Fig. 16 AD encryption credentials

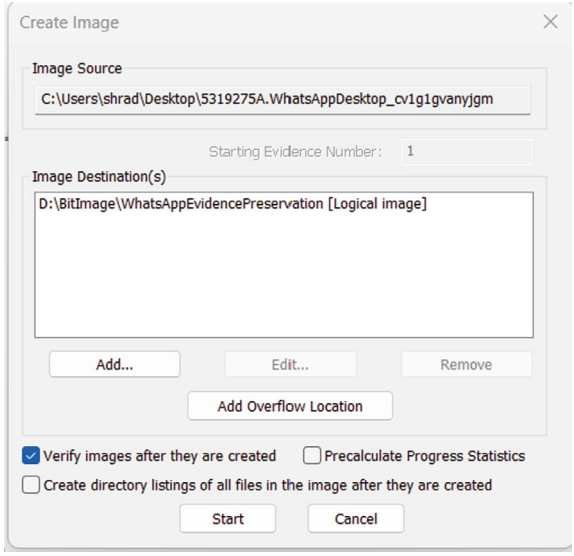


Fig. 17 Create image

5.4 Analysis

In this phase, the investigator analyzed the evidence that was extracted in the data extraction phase. In our research, we mainly analyzed the deleted media.

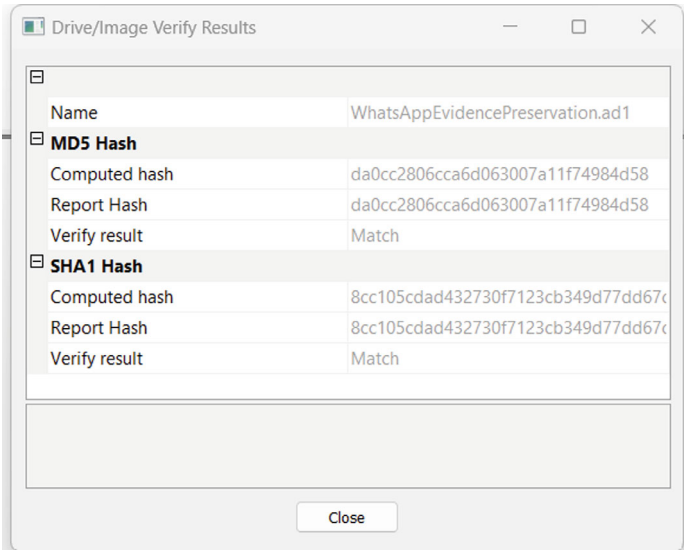


Fig. 18 Image verify results

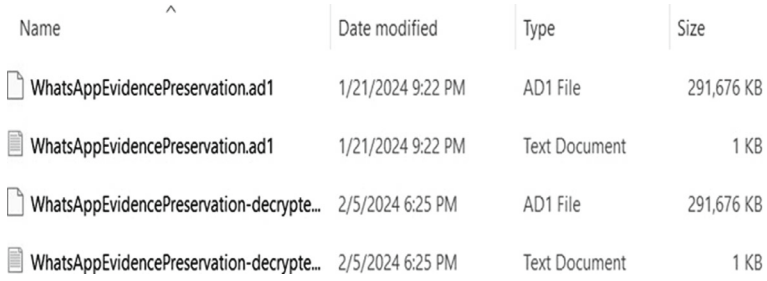


Fig. 19 AD1 file and text document of image summary

5.4.1 Analysis of Non-Deleted Media

For the non-deleted, we conducted manual analysis by visiting each and every media, and WhatsApp simplifies the process by saving the media in a weak manner for the investigator. As a result, the investigator can visit suspected weak folders.

5.4.2 Analysis of Deleted Media

The first investigator did the manual analysis and after the analysis, it was found that when a WhatsApp user transmits media to any of our WhatsApp connections, it is saved in the shared folder that is specifically allocated for media storage purposes

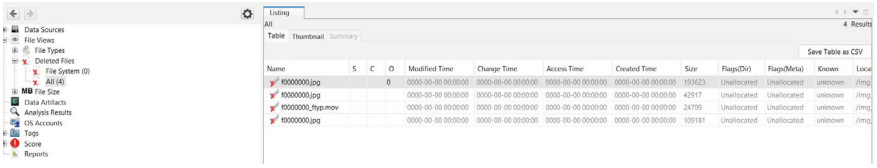


Fig. 20 Recovered deleted media

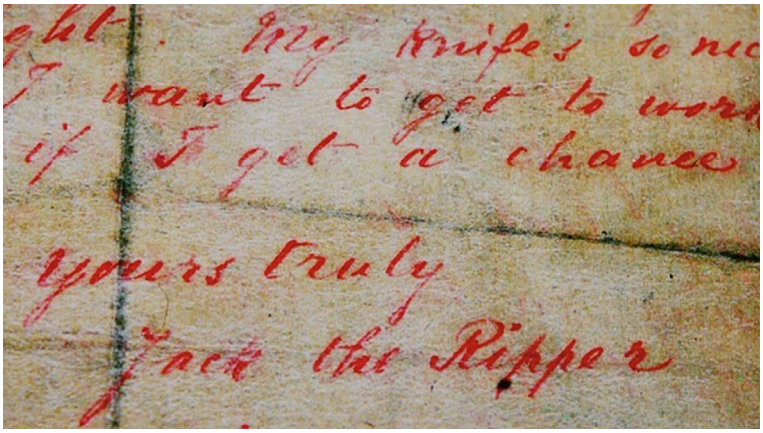


Fig. 21 Analysis of deleted media

and when we delete media from any chat, it is also deleted from the shared folder. Along with if we transfer the same piece of content more than once, it will be added to the shared folder many times with a unique code name. So, if an intruder sends any form of media to the victim, it will be saved in a folder with a unique ID and used as evidence in the context of a forensic inquiry. After that, we used the Autopsy application to recover the deleted media and observed each one in an external viewer. For the testing scenarios, we discovered that one of the extracted media contained some information about the fraud that could aid in the crime investigation as shown in Figs. 20 and 21.

5.5 Report Generation

In this phase, the investigator prepares a report based on the results of the analytical phase and sends it to the legal authority. During our investigation, we discovered that one of the media outlets was accused of providing a hint regarding the crime. During our inquiry, we discovered that one of the media outlets was accused of providing a hint regarding the crime. So, the investigator did more investigations, documented everything, and presented the findings in court.

6 Conclusion and Future Work

The use of social media applications is continuously rising, and WhatsApp is one of the most helpful applications in the world. As a result, committing a crime using a program like this has become the standard these days. In this research, we present a five-phase forensic investigation framework for WhatsApp that recovers deleted files and messages. Our framework separates the evidence collection, data preservation, data extraction, analysis, and report preparation phases. First, we gathered all of the necessary evidence from all of the locations where WhatsApp was stored. After collecting the data, we preserved all of the evidence by producing a bit image with the open-source tool FTK image and locking it with a password. During the data extraction phase, we primarily concentrated on extracting deleted media, after which we assessed this evidence and prepared a report based on the findings.

For the evaluation of our framework, we employed a variety of open-source technologies as both support and experimental scenarios. Notably, the technological procedures for gathering evidence, preserving evidence, analyzing data, and producing a report based on the findings.

Future research will apply and assess our methodology to deleted communications as well as other social media platforms including Snapchat, Instagram, and Telegram.

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Witness and Eyewitness Memory: Factors Influencing Testimony Accuracy



Wafa Abu Hatab, Bashar Jawdat Sawalmeh, and Mohammed Al-Badawi

Abstract Witness testimony is pivotal in legal proceedings, as it significantly influences the outcomes of trials and investigations. This research investigates the factors affecting witness memory accuracy and explores how lawyers facilitate accurate recall during testimony. Focusing on eyewitnesses and lay witnesses, the study highlights the burdens eyewitnesses face, including the impact of shock and memory distortion. Through the analysis of a YouTube video and the renowned Loftus and Palmer experiment (1974), the research reveals how language and leading questions can alter witness memory. Effective strategies for enhancing memory recall include cognitive interviewing, avoiding leading questions, and using visual aids like maps and pictures. These methods, alongside narrative techniques, enable witnesses to provide more accurate and detailed testimonies. The findings underscore the importance of strategic questioning and visual support in legal contexts to ensure reliable witness testimony.

Keywords Forensic linguistics · Courtroom DNA test disputes · Communication

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1 Introduction

Witnesses play an important role in any case and in courtrooms, since they are the first evidence that helps to solve any crime or to reach to any criminal. Therefore, witnesses are defined as individuals who provide testimony or evidence in legal proceedings based on their personal knowledge of events or circumstances, and their testimony can significantly impact the outcomes of trials and investigations. The importance of the witnesses' testimony comes from its affection on the outcomes of the whole case, so any wrong information can cause different outcomes. Therefore, witnesses' must recall the events as same as what happened during the action and to be accurate during their testimony. According to [3], they defined witness and their testimony as A witness is someone who offers testimony or evidence in a legal setting based on their direct observations or experiences. The precision and trustworthiness of their testimony can fluctuate due to various factors, such as their memory, perception, and the circumstances surrounding their observations. There are five types of witnesses in legal proceedings, and they are Eyewitnesses, expert witnesses, character witnesses, fact witnesses, and lay witnesses [2]. This study is going to focus on two types only, and they are eyewitnesses and lay witnesses. Eyewitnesses a concept that refers to the witnesses that observed and saw things from the crime scene, so their testimony is based on it. While lay witnesses in a concept that refers to people who provide their testimony based on their personal observations and experience. The difference between them, is that all of eyewitnesses are lay witnesses, while not all the lay witnesses are eyewitnesses, however, eyewitnesses provide testimony based on their direct observation with the event, while lay witnesses might use their experience in their testimony. According to the previous information, it can be noticed that eyewitness carry lot of burden during their testimony, since they are required to remember all the details that occurred in the crime scene. Yet sometimes they can't remember because many factors one of them for example being shocked, since it's not something familiar to them. This shock may cause problems in recalling things, the events are not accurate enough or they can't remember at all. Here the lawyer must try to guide the witness through special ways to encourage his memory, so he can recall what happened exactly there [2].

1.1 Objectives

This research aims to investigate the factors and the reasons that affects the witnesses' memory during their testimony inside the court, and how lawyers deal with the problem of not recalling the events and the inaccurate information.

1.2 Research Questions

This study aims to answer the following questions:

1. What are the linguistic strategies that are employed to activate memory?
2. How the lawyers deal with the witnesses if their testimony is not accurate?
3. What are the most effective strategies among witnesses?

1.3 Significant of the Study

It is important to investigate the problems that happens with witnesses during their testimony, and most of the researches focuses on the questions that the witnesses usually being asked inside courtrooms. To the best of my knowledge, no researches has been conducting the factors that affects the testimony of witnesses and their accuracy in recalling events. Therefore, this research aims to investigate the factors that affects testimony reliability of witnesses' memory and recalling [3].

2 Literature Review

The study by Robinson and Johnson [16] investigates the confidence-accuracy (CA) correlation in eyewitness testimony by comparing recall and recognition memory processes. They conducted an experiment with 205 college undergraduates who watched a simulated crime video and answered either recall or recognition memory questions about the video. Participants were divided into groups based on the type of memory question and rating condition, including immediate confidence, delayed confidence, and hypothesis disconfirmation. The results indicated that recall conditions yielded a higher CA correlation compared to recognition conditions, which the authors attributed to the presence of ease-of-retrieval cues in recall memory. Similarly, the study examined the effects of providing reasons for false responses and interstimulus delays between memory response and confidence judgments. This helped to distinguish between recall and recognition memory and its application to eyewitness testimony [5].

Penrod and Cutler [15] evaluated ways to improve eyewitness identification and expert testimony in legal contexts. The study was a comprehensive review of existing research and experimental research on factors influencing accurate eyewitness identification and jury verdicts. The results concluded that eyewitness identification is most accurate when procedures are used properly and when jurors receive expert testimony on the reliability of eyewitness identifications. The effectiveness of the expert opinion varied depending on the way it was presented and the characteristics of the case. The study highlights the importance of expert testimony in helping jurors make more informed decisions regarding the credibility of eyewitnesses [6].

In 2019, [9, 11, 15] sought to shed light on the distinction between honest verbal eyewitness testimony (correct and incorrect), as well as to recreate and shed light on the theoretical mechanism underlying the relationship between verbal cues to retrieving effort, self-confidence, and accuracy memory in eyewitness testimony. That same year, 22 psychology students were shown a video of a staged crime, which they later watched in an interview about what they saw [7]. This interview included both free recall and cued recall tasks in which participants were asked questions about what they saw in the video. Participants' responses were coded for effort cues (delays, hedges, and fillers) in their responses and also measured for response latency. The accuracy of participants' responses was assessed by whether the details of the statements could be objectively verified from the video footage of the crime. Participants also rated their confidence in each statement [1]. Results showed significant associations between verbal cues of search effort and eyewitness memory accuracy for a simulated crime event. Overall, fewer effort cues in utterances increased their accuracy. The study also found that response latency was a significant predictor of memory accuracy—this is the additional information that response latencies provide about retrieval effort and memory accuracy. Unlike previous research, the relationship between self-confidence and memory accuracy was unique and could not be predicted by effort cues. Finally, effort cues mediated the relationship between self-confidence and accuracy, suggesting that self-confidence may be based on retrieval effort cues rather than simply "theory-based" beliefs about memory. In the discussion, the study's results were explained as a significant contribution to our knowledge of what makes eyewitness memory accurate or inaccurate. Verbal cues to effort have been shown to be important predictors of memory accuracy, and the study highlights the role of retrieval effort on eyewitness memory accuracy. Overall, the study's results suggest potential applications for practitioners, police officers, and juries because they can distinguish between accurate and inaccurate eyewitness memories based on effort cues. Nevertheless, the results differed from previous research on the unique effects of various effort-related cues on memory accuracy and suggest that further research is needed to refine methods for examining eyewitness memory [13].

Bornstein et al. [9] Arousal induced by viewing violent or neutral films does not affect eyewitness memory recall. The article focuses on a study that examined whether arousal caused by watching violent or neutral films affects the recall of eyewitness memories. The methodology involved participants watching either a violent or a control film and then performing a series of recall tasks. Participants' anxiety and upset levels were measured at various stages: during the film, immediately after, and prior to subsequent recall attempts. The results showed that participants who watched the violent film rated it as significantly more violent and reported higher anxiety and upset levels compared to those who watched the control film. Notably, participants in the violent film condition recalled more details about the event itself but less about preceding and subsequent details compared to the control group, suggesting that arousal has a dual effect on memory: enhancing recall of central details while impairing recall of peripheral details.

Gabbert et al. [11], the primary focus of this study is to explore the effects of discussion among co-witnesses on memory conformity and accuracy. The experiment

utilized a between-subject design involving different age groups (young and old) and conditions (individual recall and co-witness recall). Participants viewed a simulated crime event from different perspectives and later engaged in either individual or collaborative recall. The study found that a significant proportion of co-witnesses incorporated information from their discussions into their own recollections, with 71% of witnesses reporting details they had acquired from their co-witness. Interestingly, 60% of participants who discussed the event with a co-witness reported the girl as guilty of a crime they had not witnessed. This indicates that memory conformity is influenced by co-witness discussion, leading to the incorporation of misinformation, regardless of the witness's perspective [8].

Gardner [12], the central theme of this research is to examine how perception and memory processes are influenced in the context of eyewitness testimony. The study's methodology involved participants viewing an event and subsequently undergoing various recall tests. It highlights the significant impact of retrieval processes on memory, suggesting that repeated retrieval attempts can enhance recall of both neutral and negative emotional events. The results underscore that while arousal from negative emotional events can impair memory for peripheral details, it enhances the recall of central details. Furthermore, repeated testing was shown to improve recall performance for both arousing and neutral events, emphasizing the role of retrieval in eyewitness memory. These findings support the notion that retrieval processes, rather than encoding alone, play a crucial role in the accuracy of eyewitness memory.

3 Methodology

Since this study attempts to investigate the factors and the reasons that affects the witnesses' memory during their testimony. Therefore, a YouTube video was used to collect and analyze the data.

3.1 Data Collection

According to video that is related to this study, the researcher used them to analyze and to see how lawyers dealt with the witnesses that can't recall the events and what are the strategies that he and she used to make the testimony accurate.

3.2 Data Analysis

The researcher used the video to notice the questions the strategies, and the language use that are applied among witness to encourage her memory to recall the events accurately, then the researcher will analyze them.

4 Result and Discussion

The researcher watched a video that is related to an experiment that was done by Loftus and Palmer during 1974, to check how the eyewitnesses might get affected by the different perspectives and how these perspectives might change the accuracy of their memory, and it might change the details that are crossing their memory. This will affect recalling information when they are trying to testify. The experiment showed that language can affect the memory of the witnesses and the accuracy of the things that the recall, since the experiment divided people into 9 groups and they were required to watch a car accident then to tell what did they see. The researcher in this experiment, used language to see if they are going to use expressions to speak about the accident that happened. Therefore, Loftus and Palmer decided to use this question "How fast was the car when they _____ into each other" and there were five choices "contacted, hit, bumped, collided, smashed" each one of these choices refer to a specific type of damage. Based on people's opinion they used the expression "contacted" to point to the lowest speed with 31.8 mph, and "smashed" to the highest speed with 40.8 mph. Then the experiment went to another point and it was applied among 150 students, and they were asked the same thing but this time their answers were between 'smashed' and 'bumped', while the last group didn't get any questions. And after one week the students were asked to describe the thing that they saw week before and the most important question was "did you see any broken glass?" based on their answers and the choices and because they choose "smashed" to describe the accident most of the students answered with yes! The important thing here is that there wasn't any broken glass in the video. According to this experiment we can notice the importance of leading questions and how it can affect the witness's memory, and another thing that people usually are confident about the things that they saw or expressed, unless they start hearing new things related to the same topic, and this will lead to some confusion within their memory. For example, it you just finished your exam and you are sure that you answered everything correctly, and your friends started to tell their answers and how they are sure about them being correct, the first thing that you are going to feel is losing the confidence in your answers, then you will start to question yourself did I answered the question this way of this way. So, the first strategy is to avoid letting the witness under the pressure or within a big community that are discussing the same topic, and avoid putting him under the control of leading questions, and to try to explain to him how to maintain his information. The second thing is the words that are used during taking the testimony from the witness, as an expert lawyer or prosecution they must learn how to choose their words and to know which word is better and will directly help the witness to remember the events correctly. Some experts suggest another strategy to deal with eyewitness accuracy, and they call it cognitive interview. Cognitive interview is basically to avoid leading questions, but ask the witness to narrate everything, this will lead the witness to say everything without filtering and without choosing the things that the interviewer wants him to say. Also, it plays a major role in the process of brain storming, in which the witness will try to remember things as much as he

can [4]. The process here is by using open-ending questions such as "what happened next?" and this method showed that the answers are more accurate than using leading questions. According to the video that the researcher watched, the lawyer starts by asking the witness about the place that the car crash occurred in, and it was a yes/no question, the question was "are you familiar with the area of Forster Parkway?" and she used word familiar with rather than asking her by using do you know or have you been to, to help here to recall the place and the things that were there in the time she visited that place. Then she asked her if she can recall why she was there during that day, the witness answered that she dropped her co-worker off because her house is there, this answer led the lawyer to ask her about the direction that she took, and if she can recall it, and she answered with no she is bad with directions. Another method was used here, in which the lawyer started showing the map to her so she can help her to recall things. And this method was helpful, since after presenting the map, the witness could identify the road that she took during that day. Here we can notice that pictures or visual materials are good strategy to help eyewitnesses to recall things and they can be used effectively if the witness can't remember the specific details that can play major roles in the evidence [14]. After, the witness recalled the place, the lawyer used a third method which is narrating the things that she observed during that day. The witness start narrating what she saw, according to the map that is in front of her and she could effectively recall things and gives accurate details such as the exact place that the accident happened in, and the type of the car. The witness could effectively recall what happened even though she was nervous and confused, the only thing that she couldn't recall very well is the speech that was between the women and the man that happened the conflict with. Then the lawyer started repeating the things that the witness just narrated to make sure that she is telling the truth. One of the methods that is used too is some pictures, of the vehicle's accident, and they were used because the lawyer asked her if she can recall her position to the Jeep of the defendant, and she answered yes, but with some hesitation, therefore, he decided to present 7 different pictures to help her recalling her position. This method was effective too, in which after seeing the pictures she could identify and recall the event accurately. According to this data, it can be noticed that different ways had used during the examination, and these methods are effectively in refreshing the witness's memory and it encouraged her to be more specific and to be more confident while she is testifying. It was noticed that, using visual things such as, pictures, maps, and videos are more effective to be used when the witness can't recall things accurately [10].

5 Conclusion

This paper aims to investigate the linguistic strategies and leading questions that are used to help the witness to recall and to testify accurately in the court. According to the video that had used to collect the data, usually lawyers present many methods to help and encourage the witness's memory and to help him to recall events. The

methods that are used are: presenting pictures, using different words that leading directly to the case, showing visual materials, such as maps, videos, and using the narrative way, in which the witness will start narrating the things that he recalls as a story then the lawyer will repeat the important parts that he wants to make sure about them. These are the most effective methods that helps the witness to recall the events accurately.

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Patent Protection in the Age of Technology: An Analytical Study of Original and Ancillary Penalties



Omar Al Makhzoumi and Jaber Al-Ghayathin

Abstract This research examines the legal framework governing penalties associated with patent rights infringement in Arab nations. Its objective is to analyze the penalties applied for patent infringement, encompassing both primary and ancillary penalties, while also comparing various legal systems across Arab countries. Furthermore, the study aims to elucidate the significance of patents as a protective measure for technological and creative innovations, outlining the rights granted to inventors, including legal safeguards against infringement. It also investigates the legal repercussions that can arise from violating patent rights, detailing both criminal and civil penalties imposed on individuals and corporations that breach these rights. A descriptive-analytical approach was employed to gather and analyze legal and legislative information regarding patents in Arab countries, concentrating on the relevant laws and penalties. The findings revealed that penalties for patent infringement comprise a range of original and ancillary penalties designed to protect inventors' rights and ensure effective enforcement of the law. Additionally, the results highlighted that patent legislation across Arab countries differs in terms of penalty specifics and enforcement procedures, which influences how infringement cases are managed. The study advocates for improved coordination among Arab nations to harmonize patent-related laws, thereby enhancing rights protection and streamlining the legal processes concerning infringement of these rights.

Keywords Patents · Legal penalties · Infringement · Intellectual property protection · Arab countries · Legal legislation · Judicial applications

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1 Introduction

An invention results from a creative process focused on developing or enhancing a product, process, or device designed to address a specific need or resolve an existing issue. Defined as a novel idea applied in an innovative way, an invention creates a product or technology that did not exist before. Inventions can encompass a wide range of fields, with technological inventions being a crucial aspect of contemporary innovation. These technological advancements involve creating new tools, devices, and methods grounded in scientific and technological progress. Furthermore, inventions may extend to other disciplines such as chemistry, physics, and engineering, showcasing the diversity and significance of innovation across various industries.

A Patent Certificate is issued to safeguard an invention. This certificate is awarded to protect the invention provided it fulfills the required criteria for issuance and confers various rights to the owner, including the authority to prohibit others from using, making, selling, or displaying the invention without the consent of the patent holder. Additionally, it enables the owner to exploit and exclusively utilize the invention and participate in all legal dealings related to it.

It is important to highlight that legal protection for the patent holder commences only from the moment the relevant authority grants the patent, in line with comparative patent legislation. The holder, whether the original inventor or their legal successors, possesses various rights under the patent issued by the relevant authority. These rights include the ability to control the invention and to exclusively exploit it for financial gain within a defined timeframe and specific conditions. Any unauthorized use of the patent holder's rights without permission results in both criminal and civil liability. Comparative legislation establishes civil and criminal penalties for any infringement upon the inventor's rights, thereby ensuring civil protection through the prevention of unfair competition. The inventor has the right to pursue compensation for damages caused by infringements and may also seek international protection for the invention beyond the jurisdiction of the granting state [1].

There is no doubt that violating the rights of a patent holder constitutes a legally punishable offense. As previously outlined, the law offers legal safeguards for patent holders via both civil and criminal avenues. Comparative legislation outlines both primary and ancillary penalties for individuals who infringe upon the rights of patent holders [2].

This study seeks to examine the various original and ancillary penalties established for patent rights violations in Arab nations, with an emphasis on the regulation of these penalties and procedures in infringement cases.

1.1 Study Objectives

- Explain the importance of patents as a means of protecting technological and creative innovations.

- Analyze the legal framework for patent infringement penalties in Jordan, Egypt and the United Arab Emirates.
- Compare how penalties and procedures for handling patent infringement cases are structured and identify similarities and differences.
- Identify how courts apply penalties and interpret laws to understand the practical issues and challenges facing the justice system.
- Propose improvements to the effectiveness of penalties and strengthening patent protection in line with international best practices.
- Highlight the importance of patent protection and the consequences of infringement, contributing to better enforcement of intellectual property laws and regulations.

1.2 Methodology

This research employs a descriptive-analytical approach to investigate penalties associated with patent rights infringement by gathering and scrutinizing pertinent legal and legislative information. It commences with the collection of data on patent laws and penalties in Jordan, Egypt, and the United Arab Emirates through an examination of relevant legal texts and regulations. A comparative analysis of the legislation follows, aimed at uncovering both similarities and disparities within the legal frameworks of the three nations. Furthermore, the methodology incorporates an examination of applicable judicial practices to gain a more profound insight into the application of penalties and the interpretation of laws by the judiciary. Content analysis is utilized to review judicial rulings and evaluate the efficacy of penalties in fulfilling patent protection objectives. The study aspires to provide recommendations derived from both descriptive and practical analyses to enhance the legal framework and formulate effective strategies for bolstering patent protection.

2 Definition of Punishment

Criminal law scholars have offered various definitions of punishment in their literature. One such definition describes punishment as "a deliberate infliction of pain imposed due to a crime and proportional to it." Another perspective refers to it as "the consequence prescribed by law that affects the criminal due to the commission of the crime". Furthermore, punishment is characterized as "a criminal sanction that involves deliberate pain prescribed by law and imposed by a judge on anyone proven to be responsible for the crime".

From this definition, several characteristics of punishment become evident [3]:

1. **Legality of Punishment**: This means that punishment must be based on a legal provision.

2. **Personal Nature of Punishment**: This indicates that the pain and harm of the punishment affect only the convicted individual, whether they are the principal actor or an accomplice in the crime.
3. **Judicial Nature of Punishment**: In essence, the judicial nature of punishment affirms its legality; there can be no punishment without a legal text and no punishment without a judicial ruling.
4. **Equality in Punishment**: This principle ensures that punishment is applied equitably and fairly.

3 Original Penalties

Anyone who violates the rights of a patent holder—whether through counterfeiting a patented invention, selling or intending to sell, offering for trade or sale, importing counterfeit items related to the patented invention, falsely claiming to have obtained a patent, falsifying entries in the patent register, or utilizing forged documents from that register—becomes subject to legal repercussions [4]. According to Article 32 of the Jordanian Patent Law, the penalties include:

1. Imprisonment ranging from a minimum of three months to a maximum of one year.
2. A monetary fine between one hundred dinars and three thousand dinars.
3. A combination of imprisonment and fines [5].

In Egypt, the legislator has outlined the primary penalties in Article 32 of the Intellectual Property Protection Law as follows:

1. A financial penalty of no less than twenty thousand pounds and no more than one hundred thousand pounds.
2. For repeat offenses, imprisonment for up to two years along with a fine not less than forty thousand pounds and not exceeding two hundred thousand pounds [6].

At the same time, the legislator in the UAE has outlined the initial penalties in Article 62 of the Federal Law, which include:

1. Imprisonment.
2. A monetary fine ranging from a minimum of five thousand dirhams to a maximum of one hundred thousand dirhams.
3. A combination of imprisonment and a fine [7].

The legal documents indicate that the Jordanian legislator has established penalties for the infringement of patent rights, which include imprisonment for a duration of three months to one year, along with fines that range from one hundred to three thousand dinars, or potentially both penalties combined. However, the legislation does not address penalties for repeat offenses. In contrast, the Egyptian legislator has set an initial penalty that consists of a financial fine between twenty thousand and one hundred thousand pounds, while also increasing the consequences for repeat

offenses to imprisonment for up to two years and fines ranging from forty thousand to two hundred thousand pounds. Notably, neither the Jordanian nor the UAE patent laws provide specifications for penalties related to repeat offenses. These legal texts reveal significant differences among legislators in their approach to defining penalties, particularly concerning information technology and contemporary innovations that demand robust protection of intellectual rights. The rapid pace of technological advancements underscores the need to revise these laws to adapt to swift changes in innovations and to guarantee effective safeguarding of intellectual property rights.

4 Ancillary Penalties

The rights of a patent holder cannot be violated by anyone, regardless of whether the infringement consists of replicating a patented invention, selling or proposing counterfeit items, importing goods for sale, making false claims about a patent, or fabricating records from the patent register or utilizing forged documents from that register. The patent holder is entitled to pursue all legal avenues to safeguard their rights associated with the patent or implement actions that could discourage the offender from committing these acts [8]. Additional penalties may involve seizure and destruction of the infringing items.

4.1 Confiscation

Confiscation refers to the act of seizing the materials and tools utilized in violating a patent. This is addressed by the Jordanian legislator in Article (33/Z) of the Jordanian Patent Law, which empowers the court to mandate the confiscation of products, tools, and materials that were primarily employed in the creation of the infringing products or those derived from such infringement [9]. In Egypt, Article (32) of the Intellectual Property Protection Law stipulates that the court is required to order the confiscation of counterfeit goods and the tools involved in their counterfeiting, with the judgment being published in one or more daily newspapers at the convicted party's expense [6]. Meanwhile, in the UAE, Article (63) of the Federal Law permits the court to command the confiscation of items that have been seized or those seized later, along with the destruction or removal of any effects resulting from the illegal action, including the machinery used for forgery. Additionally, the court may require the publication of the judgment in a bulletin or local daily newspapers at the cost of the convicted individual [7]. In accordance with these legal stipulations, the court has the authority to order the seizure of tools utilized in the offense of patent infringement or in deceiving the public to secure a patent for engaging in such infringement, or any other legally punishable act, upon the request of the patent holder whose rights have been violated. Consequently, machines, items, or counterfeit goods may be confiscated to account for their worth [10]. Furthermore, it is evident that the comparative legislation is

consistent with the TRIPS Agreement regarding the confiscation of items employed in the reproduction of the patented invention [11].

Conversely, the current technological revolution has made innovations essential to the global economy, heightening the necessity of patent protection. Patent infringement involves the unauthorized utilization of technology to duplicate patented inventions, inflicting considerable damage on inventors and businesses alike. Contemporary legislation addresses this concern, as evidenced by laws like the Jordanian Patent Law, the Egyptian Intellectual Property Protection Law, and the UAE Federal Law, which establish stringent protocols for the confiscation and destruction of tools and materials involved in infringements [12].

A major technological hurdle lies in the tracking and monitoring of counterfeit patents. The use of modern advancements, including artificial intelligence systems and digital analysis tools, is vital for improving confiscation processes. For instance, technology can effectively pinpoint and monitor counterfeit items, thereby simplifying the actions that legal authorities need to undertake. Furthermore, advancements in digital management and electronic record-keeping significantly aid the protection of patents by enhancing transparency in legal proceedings and streamlining the collection of evidence.

The principles of the TRIPS Agreement and comparative legislation illustrate this trend, harmonizing with advancements in technology and aiding in the preservation of rights related to technological innovation. The incorporation of technology in this domain allows for the provision of more robust patent protection, thereby boosting confidence in the legal framework that protects innovations from unlawful infringements [13].

4.2 Destruction

Legislation on the comparative front empowers the appropriate court to eliminate counterfeit goods alongside the equipment and tools utilized in reproducing patented items. The decision to destroy machinery is at the court's discretion. When counterfeit products present a threat to public health—particularly those related to food or medicine that fail to meet health standards—destruction is permitted. However, if such counterfeit items do not endanger public health, destruction is prohibited, as it is only allowed in situations of dire necessity, indicating that the counterfeit goods must be detrimental to public well-being. Article (33/Z) of the Jordanian Patent Law provides that the court has the authority to mandate the destruction or disposal of these items for non-commercial uses. This clause enables the court to instruct the destruction of tools and machines involved in patent violations or to dispose of these products, as long as it is for non-commercial purposes.

In this scenario, it is clear how crucial technology is for identifying and managing counterfeit goods. Tools like artificial intelligence and big data analysis can effectively trace these counterfeit items and confirm their origins. Additionally, sophisticated scanners and electronic tracking devices play a significant role in recognizing both the products and the equipment utilized in forgery or duplication [14].

Article (35) of the Egyptian Intellectual Property Protection Law empowers the head of the relevant court to issue one or more precautionary measures for enforcing fines or compensation, based on a petition submitted by any interested party. If deemed necessary, the court head may also command the destruction of seized items [7]. This provision illustrates that the Egyptian legislator permits any interested party to request precautionary measures, which can include the destruction of items utilized in replicating the invention. In contrast, while Jordanian law grants the court the authority to order destruction, it does not clarify whether this power resides with the head of the court or the judge overseeing the case [15].

According to Article (63) of the Federal Law, the court has the authority to mandate the removal or destruction of items related to an illegal act, which encompasses tools and machinery utilized in forgery. This provision allows the court to issue such directives even in instances where an acquittal has occurred [16]. Thus, the court can order the destruction of equipment employed in forgery or duplication.

According to these legal documents, only the court has the authority to confiscate and destroy machines and tools involved in patent infringement, unlike the three legislations from Jordan, Egypt, and the UAE, which also designate the court as the exclusive body for handling items related to copying or forgery.

4.3 Verdict Publication

The right to publish a judgment lies with the court against individuals who violate the rights of the patent holder, those who replicate counterfeit items, or those who obtain such items for sale, offer them for sale, import them for sale, or falsely assert having acquired a patent for the invention. According to Egyptian law, this publication may occur in one or multiple newspapers. It is required that the publication appears in a local daily newspaper or a bulletin, with the costs borne by the convicted individual. A comparable framework exists within UAE legislation [6].

According to Article (63) of the Federal Law, the court has the authority to mandate the publication of the judgment in a bulletin or a local daily newspaper, with the costs borne by the convicted individual [17]. Similarly, Article (32) of the Egyptian Intellectual Property Protection Law stipulates that the court must order the confiscation of counterfeit goods and the tools involved in the infringement, and it also requires the judgment to be published in one or more daily newspapers at the expense of the convicted party [18]. When comparing these three pieces of legislation, it becomes clear that the Jordanian Patent Law lacks a provision for penalizing publication in newspapers or bulletins.

4.4 Judicial Applications

- Decision of the Jordanian Court of Cassation No. 363/2008 (Ordinary Panel) dated 22/10/2008 published by the Adalah Center:

Article (21) of the Jordanian Patent System No. (97 of 2001) and its amendments imply that the patent registrar is authorized to seek technical expertise from any organization deemed necessary to verify whether the conditions for the protection of an invention, as outlined in Article (3) of Patent Law No. (32 of 1999) and its amendments, are satisfied. These conditions pertain to novelty, inventive activity, and industrial applicability as defined by the law. Consequently, the patent registrar sought technical expertise from the following official Jordanian universities: 1. Jordan University, 2. Jordan University of Science and Technology, 3. Mutah University, and 4. Al-Balqa Applied University. Jordan University concluded that the conditions for protection were fulfilled, while Jordan University of Science and Technology did not perform the expertise [19–22]. Al-Balqa Applied University's response was deemed unlawful and included critiques and recommendations for modifying the invention, alongside advice directed at the patent registrar. In contrast, Mutah University opined that the invention failed to meet the legal criteria for patent protection. Considering these inconsistencies, the patent registrar ought to have consulted five specifically identified technical experts who possess knowledge and specialization in the invention's subject matter prior to rendering the appealed decision. The registrar should have based his decision on their expert report. Neglecting to take this step renders the appealed decision premature and liable for annulment [17].

- Decision of the Jordanian Supreme Court No. 117 (Five-Member Panel) dated 14/6/2010 published by the Adalah Center:

Should the technical examiner determine that a European document numbered (EP1775287) exists, which claims the same priority as the appellant's request, it indicates that the appellant's submission lacks novelty and innovation [23–25]. Article (13) of the Jordanian Patent Law No. (32 of 1999) and its amendments empower the respondent to reject the patent application due to non-compliance with the stipulations of Article (3) of the same law. Given that the appellant's request is in violation of this provision and no evidence has been provided by the appellant to refute the contested decision, the reasons for the appeal are baseless, leading to the conclusion that the case should be dismissed [18].

- Decision of the Jordanian Supreme Court No. 118/2010 (Five-Member Panel) dated 14/6/2010 published by the Adalah Center:

Should the technical examiner determine that a European document numbered (EP1775288) exists, which claims the same priority as the appellant's request, this would indicate a lack of novelty and innovation in the appellant's submission. Furthermore, Article (13) of the Jordanian Patent Law No. (32 of 1999) and its amendments empower the respondent to deny the patent application if it fails to meet the criteria

outlined in Article (3). Given that the appellant's request is in violation of this regulation and no evidence has been provided by the appellant to challenge the contested decision, the basis for the appeal is without merit [26].

- Decision of the Jordanian Supreme Court No. 112/2010 (Ordinary Panel) dated 9/6/2015 published by the Adalah Center [25, 27–29]:

Should the decision from the administrative appeal reveal that the applicant's request was determined to lack novelty and innovation based on technical evaluations from Jordanian and European sources, then this request contravenes Article (3/A/1) of the Patent Law and its amendments No. (32 of 1999). Given that Article (13) of the aforementioned law empowers the respondent to deny the patent application if it fails to meet the stipulations of Article (3), and considering that the appellant has not provided any proof to challenge the disputed decision, the grounds for the appeal are without merit, leading to the case being subject to dismissal (Supreme Court 117/2010 dated 14/6/2010, 118/2010 dated 14/6/2010) [30].

- Decision of the Jordanian Court of Cassation (Rights) No. 1722/2013 (Five-Member Panel) dated 6/10/2013 published by the Adalah Center [31]:

From Article 33/B of the Patent Law, one can deduce that a patent holder alleging infringement prior to initiating a civil or criminal lawsuit may request the court to implement any precautionary measures outlined in paragraph A of this article without informing the respondent, provided they can demonstrate ownership of the patent and that their rights have been violated or that an infringement is imminent and poses a risk of irreparable damage [32]. The respondent is entitled to contest the ruling within eight days from the date of notification or awareness, with the appellate court's ruling being conclusive. Therefore, a cassation appeal is subject to dismissal since it relates to a definitive and non-appealable ruling, and the granting of permission to appeal does not change the situation [33].

- Jordanian Court of First Instance, Irbid, Appellate Panel No. 3366/2016 dated 31/8/2016 [28, 29, 34]:

Concerning the basis for the appeal, it is summarized that the decision being contested contradicts the law, as there is no evidence in the case file demonstrating that the complainant possesses a patent as outlined by Articles (2, 8) of the Patent Law. Thus, the complainant lacks the entitlement to assert rights reserved for a patent holder as specified in Article (21) of the Patent Law [35]. As a result, it is both legally and logically unfathomable to find the defendants guilty of breaching Article (32) of the Patent Law, given that the complainant has not secured a patent certificate from the appropriate authorities in accordance with the law. Therefore, since the grounds for the appeal pertain to the contested decision and the first-instance court failed to assess the evidence accurately and appropriately, the grounds for the appeal are legitimate, warranting the annulment of the decision [19].

5 Conclusion

This research underscores the necessity of strengthening patent protection in Arab nations through an examination of the primary and ancillary penalties established for violations of patent rights. By evaluating the legal frameworks and judicial practices across Arab countries, the study offers an in-depth perspective on enhancing the efficacy of penalties and bolstering the protection of innovation. Given the growing significance of technology in driving innovation, improving legal structures plays a crucial role in protecting the rights of inventors and nurturing an environment conducive to innovation within the Arab world.

5.1 Findings

The study concluded the following results:

- Penalties for patent infringement include various types of primary and ancillary penalties designed to protect the rights of inventors and ensure effective enforcement.
- Patent laws in Jordan, Egypt and the United Arab Emirates have differences in the details of penalties and enforcement procedures, which affects how infringement cases are handled.
- Court filings in patent cases reveal inconsistencies in the interpretation and application of penalties, highlighting the need to harmonize and coordinate legal policies to facilitate the protection of intellectual property.

5.2 Recommendations

This study recommends the following:

- Improving coordination between Arab countries to harmonize patent legislation, contributing to better protection of rights and streamlining legal procedures related to infringement.
- Increase legal awareness of patent laws and infringement penalties through targeted awareness programs for inventors, businesses and lawyers.
- Encourage countries to adopt more effective methods of enforcing penalties and providing accountability for patent infringers, in line with international standards for intellectual property protection.

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Screen Time and Cognitive Development: Understanding the Psychological Impact on Children in the Digital Age



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Abstract This paper is concerned with the psychological effects of screen time on children's cognitive development in the digital age. Because technological instruments are part and parcel of our daily life, it is important to understand how increased exposure to screens relates to attention as well as memory and other cognitive outcomes such as problem-solving abilities. Taking a qualitative design, this study will work on a descriptive literature review comprising theories, empirical studies, and applications related to exploring the cognitive implications of screen time. An analytical approach involves identifying key themes through which factors like duration of screen time or type of content and context influence the development of cognition. The results show that there are many dimensions regarding the effects of screen time; some may be negative for cognitive development, while others positive. It also calls for balanced use with further research needed to fully understand all mechanisms at play between different aspects taking into consideration individual needs which helps in planning intervention programs.

Keywords Screen time · Cognitive development · Psychological impact · Children · Digital age · Attention · Memory · Problem-solving · Qualitative research · Empirical studies

1 Introduction

The following is a brief overview of the introduction to that essay, which puts its focus on understanding the psychological impact of screen time on chidren's cognitive development in the digital age. It stresses how pertinent and important it is to investigate the relationship between screen hours and development of cognition

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these days. Since electronic devices are now essential in carrying out virtual work and education, there is a need to study the possible cognitive deficits that come with more extended screentime exposure [1]. Indeed, the COVID-19 pandemic increased total screentime for all age groups; thus, it becomes very important to study cognitive outcomes and how much influence screens have on them during this period, especially for young adults who are undergoing major lifestyle changes [2].

1.1 Research Significance

The importance of this study is to further investigate the relationship between screen time and the cognitive development of children during this time when digital engagement is everything. Electronic devices are now inseparable in terms of education, entertainment, and socialization; therefore, understanding their psychological impact on young brains is vital. This research thus deals with a very important issue relating to modern parenting and education: the influence of long periods of screen exposure on cognitive functions such as attention, memory, and problem-solving abilities. According to the huge increase in screen time—specifically for children—this has very current results related to possible cognitive deficits and advantages. Emphasizing optimal screen-time balance, this paper adds its weight on ongoing campaigns that seek healthy digital habits for kids, thus guaranteeing support of their cognitive growth (including general well-being) within an atmosphere dominated by digital devices.

1.2 Methodology

This qualitative research looks into the psychological effect that screen time has on the cognitive development of children living in the digital era. Descriptively, it will review previously published works—both theories and empirical and practical applications—that have examined the association between levels of screen exposure and outcomes at the cognitive level, such as attention, memory, and problem-solving abilities. After that, an analytical approach based on this evidence is taken to identify key themes and patterns concerning how variables like duration of screen time, type of content, and context of use impact cognitive development. The blend in these methodologies helps ensure a complete exploration that is likely to be very insightful in generating well-informed recommendations.

2 Theoretical Frameworks in Developmental Psychology

Within developmental psychology, theoretical frameworks offer vital perspectives in understanding the evolution of children's cognitive capacities. Two key theories in this area include Piaget's Theory of Cognitive Development and Vygotsky's Sociocultural Theory [3]. Piaget's theory underscores that there is a preeminent impetus on the innate abilities of children to construct knowledge through their interactions with the environment. According to Piaget, children move from one stage to another regarding development where each of these stages is marked by specific ways of thinking and understanding the world [3]. Vygotsky's sociocultural theory, in contrast, brings out the role played by social interactions and cultural influences in children's cognitive development. It was proposed by Vygotsky that learning and development takes place within a social as well as cultural environment whereby it is facilitated by those who are more knowledgeable including parents, teachers and peers [4].

These theoretical frameworks are very useful in the study of children's cognitive development and the potential effect of screen time in this digital era. Understanding how children learn in different ways and acquire knowledge will enable researchers and practitioners to evaluate the impact of digital devices on their cognitive development. Additionally, these theories help to understand how we can assess the effect of screen time on children's cognitive abilities concerning problem-solving plus language development and social interaction that may be induced. Hence, a proper understanding of Piaget's Theory of Cognitive Development and Vygotsky's Sociocultural Theory will lead us to some psychological effects that might result from allowing children much screen time in this information age [5].

2.1 Piaget's Theory of Cognitive Development

In the field of developmental psychology, the theory of cognitive development by Jean Piaget is very important. Piaget maintained that children move through four separate stages of development of cognition, at the center of each one's ability to comprehend and interpret the world around them [5]. These are, in order, the sensorimotor stage, preoperational stage, concrete operational stage, and formal operational stage. Concrete operations have certain cognitive limitations and abilities specific to each phase that determine how children will view, reason and problem-solve.

Piaget's theory stresses that children themselves build up their worlds through action with the environment, where they do not just sit back and wait for information to be brought to them. He identified play and exploration as central vehicles to developing cognition because through these activities, children experiment and learn about concepts such as conservation, reversible thinking, object permanence, and others. Piaget's theory did much to influence our thoughts on the development of

cognitive abilities in children and provided a model for educators and parents with respect to ensuring healthy cognitive development for children in this digital age [6].

2.2 Vygotsky's Sociocultural Theory

Theory of mind developed by Vygotsky in cognitive developmental theory is the sociocultural framework emphasizing the roles of culture, social interaction, and language in Piaget's sociocognitive and sensorimotor development. While Piaget's theory is based on individual exploration and discovery, Vygotsky held that the history of social relations was involved in forming higher psychological functions [6].

The center of Vygotsky's theory is the idea of the Zone of Proximal Development (ZPD); that is, the distance between what a child can do on his own and what he can do with the help of a more knowledgeable other such as a teacher or parent. In other words, where learning takes place according to Vygotsky, is within this zone as children participate in co-operative activities and interactions through which they come to acquire new skills and knowledge [7].

Another crucial aspect of Vygotsky's theory is the notion of scaffolding: whereby more experienced individuals give temporary support for children to accomplish the task above their ability levels. The scaffolding fades gradually as the child becomes more competent to enable them to take on more complex challenges independently. In addition, Vygotsky emphasized the significance of language in cognitive development, considering it a tool for communication plus the solution and representation of mental problems. He argued that through social interactions and use of language, children internalize what surrounds them from cultural practices down to values and ways of thinking; this internalization significantly affects cognitive development.

In general, Vygotsky's sociocultural theory provides valuable insights into social, cultural, and linguistic factors that contribute to children's cognitive development and adds an important psychological dimension to the effects of screen time on kids in this digital era [7].

3 Screen Time and Cognitive Development: An Overview

Screen time is very common in the daily routines of children, with a sharp increase in total time spent on screens by all age groups. Evidence has indicated that screen time can influence different domains of cognitive functioning—including attention, memory, speed processing and problem-solving ability. Yet the effects of screen time on cognitive abilities have been controversial findings show consistent negative effects contingent upon duration and type of media consumed. For instance, although general findings suggest that video games improve attention skills, a pathological gaming behavior may be related with problems of attention [8]. Likewise, heavy use

of social networking sites or Internet surfing has shown relationship with enhancing attention performance regarding both children and adolescents. With the continuous evolution of digital devices and applications, ongoing research is needed to understand the multifaceted impact of screen time on cognitive development: particularly in younger age groups.

3.1 Effects of Screen Time on Cognitive Development

Screen time and its effects on cognitive development is a major worry in the 21st Century. Studies have shown that excessive screen time can negatively affect children's attention and focus. Screens provide continuous stimulation, making it hard for children to concentrate on any single task; this may result in attention-related issues. In addition to that, too much screen time has been associated with poorer memory and cognitive functioning among children [9]. This is because constant exposure to information that is fast-paced and ever-changing leads to brain overloading; consequently, retrieval and retention of information by children become quite difficult. Furthermore, screen time can also harm problem-solving skills in children. This is because most screen-based activities are passive in nature, thus denying kids the chance to engage in active problem-solving and critical thinking; important aspects for cognitive development. Parents or caregivers should mind the kids' screen time and body it with some other cognitive activities [9].

Attention and Focus

The problem is okay. It is a necessary evil of our time, the issue of screen time and its impact on children's attention and focus. According to research, excessive screen time may be related to difficulties with attention span and focus because of constant multitasking and quick changes of stimuli typical for digital media. This may in turn affect a child's ability to concentrate at school or even take part in meaningful conversations, not to mention completing any tasks that require sustained attention [9]. Comments should be left by parents or educators on the possible influence of screen time on attention and focus as well as on healthy screen time habits favoring balanced development of focus along with other cognitive skills in their children. In addition to being incredibly important for children's learning and cognitive development, the formation of attention and focus allows them to process information, participate in solving problems, make decisions based on information learned due to this development. Time may be potentially cutting in the development of these essential cognitive skills that would later manifest challenges in carrying out good performance at school and more global cognitive abilities [10]. Thus the psychological effect of screen time on children's attention and focus to support optimal cognitive development, through healthy screen time habits is very important. In understanding the psychological impact that screen time has on children's attention and focus, parents, educators, and policymakers can take steps towards creating a

more balanced as well as developmentally supportive digital environment for children at present in the digital age.

Memory

In this digital age, with children using screens more and more as well as digital devices, the effect of screentime on cognitive development—including memory—has attracted ample interest. For a child's overall cognitive growth, memory holds a very important position because it affects learning plus the capacity for problem-solving and decision-making. Studies indicate that there can be both short- and long-term effects on memory due to excessive screentime [10]. In the short term, difficulty may be there in retaining information or remembering details explained earlier; in the long term, effects may extend to the development of working memory and long-term memory function.

Screen time can have an equally potential effect on impeding the development of spatial memory that involves later on navigation and conceptualization of spatial relationships. Moreover, viewing highly dynamic and visually rich content throughout may well contribute to the attentional demands that could act as an obstacle in the processes of memory recording and retrieval. Thus parents and educators should recognize these impacts and advocate activities that enhance all aspects of memory, such as getting involved in hands-on learning experiences– which also assist in stimulating visual and spatial memoirs. Understanding how screen time influences memory can aid us more in assisting children to develop healthy thought functions into this digital age [11].

Problem-Solving Skills

The relationship between screen time and its effects on problem-solving abilities among children is one important area that should be studied within the scope of cognitive development because problem-solving skills are essential for effective functioning in daily life and academic-related activities. Evidence indicates a relationship between too much screen time and decreasing problem-solving ability, given that prolonged engagement with digital devices will result in the child being obstructed from thinking rationally and innovatively, in turn having long-term consequences on their cognitive growth and general life achievements.

The potential displacement of activities that promote critical thinking and problem-solving, such as outdoor play and hands-on learning experiences, is one of the key factors contributing to how screen time does so to problem-solving skills. In addition, prolonged screen time can result in decreased sustained attention, which is in turn needed for effective problem-solving: children will therefore find it difficult to analyze complex situations [12]. This means they will also be unable to generate innovative solutions or adapt to new challenges. Understanding the psychological impact of screen time on problem-solving skills is thus quite crucial for parents, educators, and policymakers; in so doing, they can facilitate healthy cognitive development into this digital age.

4 Factors Influencing the Impact of Screen Time

The effects of screen time on children's cognitive development are contingent on a variety of factors. At the very top of this list is the quality and content of such screen time, in addition to its duration and how often the exposure takes place. Whether children are exposed to educational programs or to violent and inappropriate material has a weighty effect on cognitive development. Equally relevant is the quality of screen time with respect to interactivity and how interesting it is. Equally, one has to consider how long these children watch the screens and how frequently that happens [13]. This is because prolonged use of screens results in adverse effects on cognitive development in children; they develop shorter attention spans and perform poorly academically as a result. On the other hand, this can be mitigated by taking balanced breaks during moderate screentime with variety so as not to pile pressure on them from this source. Through these variables, parents, educators, and policymakers can perceive the psychological effect of screen time on children in the digital era and advocate healthy cognitive developments for appropriate technological settings of the present world.

4.1 Content and Quality of Screen Time

When considering the impact of screen time on cognitive development in children, the quality of the content kids are watching becomes very important. Because it can have a significant effect on the psychological development of the child in addition to just what type of content it is. Research has shown that educational content and high-quality media can positively affect cognitive development [14]. While exposure to low-quality or inappropriate content negatively affects this development. Parents and caregivers need to check on what their children are consuming regarding content type and quality of media. Besides, whether or not it is interactive, screen time will also be determinant to its quality. Interactive and educational media will provide cognitive stimulation as well as help instill critical thinking skills in children [15]. Passive and mindless content, on the other hand, might reduce cognitive engagement and impede cognitive development. Thus, the provision of top-quality interactive learning content should be of priority for children during their screen time. In doing this, we will help in making sure that screen time impacts positively on cognitive development in this digital era.

4.2 Duration and Frequency of Screen Time

In looking at the effects of screen time on cognitive development in children, one has to consider very strongly the length and repeat digital exposure that the child

has. Studies have reported that the duration children spend in front of screens and how many times they indulge in screen-based activities can cause remarkable effects on their cognitive development. Concerning the duration of screen time, research has indicated a relationship between increased screen time and attention difficulties, lower academic performance, as well as poor social skills [15]. Not only that but also the frequency of repeat screentime, since very frequent repeated exposure to digital media might have cumulative effects on the cognitive development of children.

Guidelines and limits set by parents, teachers, and policymakers on children's media use should address the length of time and how often a child views screens. Understanding the potential impact of excessive screen time on cognitive development can help in developing strategies to promote healthy media habits and mitigate any potential negative effects. When one addresses both the duration and frequency of screen time, it reveals the ability to pay equal attention to both technological use for supporting children's cognitive development and maintaining a healthy lifestyle. The subsequent specific research findings and theories regarding the impact that duration and frequency of screen time have on children's cognitive development are a valuable resource for those interested in promoting healthy media habits as well as general support toward children's overall well-being [16].

5 Screen Time and Social-Emotional Development

Screen time has a very significant effect on the social-emotional development of children. Indeed, there is evidence to suggest that the social context in which children use screens is related to its outcomes, with parental co-viewing of screens associated with better language outcomes. Also, it is likely that highly interactive videochat technology use would be very beneficial for socialization among older preschool-aged children. However, findings on parental technoference (i.e., the negative effects of parental distraction by technology on children) lead to less responsive parenting and fewer interactive activities with the child [16]. In addition, background media exposure has a relationship with poorer language development because it distracts the child from paying attention to ongoing play activities. Hence decreasing chances for more complex or higher-quality play [16].

This underscores the imperative detailed view regarding the impact of screen time on children's social and emotional development, within specific contexts and modes of media consumption.

6 Interventions and Guidelines for Healthy Screen Time Use

In addressing the challenges of screen time, caregivers, educators, and healthcare providers should adopt interventions and guidelines that aim to salvage what can be saved in protecting children as much as possible against the negative psychological impact of screens on the cognitive development of children. The very first thing that is very important is to realize and appreciate fully that screens are here to stay. Digitized are the means through which work is done, education provided, socialization carried out and entertainment enjoyed leading technology to be extremely pervasive in life across all different ages, socioeconomic status, and cultural background this is not inherently a bad thing but rather the result of digital technological progress. Screen devices per se are not good or bad; it's their usage that makes them so [17].

The following guidelines were developed by the Australian government and are a good starting point for families and caregivers passionate about addressing obstacles to healthy screen preference in children: "Children aged 2–5 years should spend no more than 1 h per day on 'small screen' recreation; less is better. (> 1 h = high risk) Children aged 5–12 years should spend no more than 1 h per day. (> 2 h = moderate or high risk) Children aged 12–18 years should spend no more than 2 h per day watching TV/videos. Children < 2 years should not watch TV/videos". Other recommendations that companies embracing a service model to kids may want to consider include psychosocial health promotion practices, promotion of sedentary activity restrictions during family meals, making school policies (and compliance) for screen time, and advocating children to school/child-care spatially or socially via active commuting– rather than passive commuting via privately owned vehicles [17]. Some culturally specific suggestions– such as the safety regarding the beliefs held about safety during active commuting should be viewed critically and possibly as groups to be further challenged. The advocacy of new cycling infrastructure and increased road safety measures would be beneficial as well.

The most effective way to foster a screen-free early life to the extent potential is by leading a disconnected lifestyle yourself. Leading a disconnected lifestyle does not mean enrolling children in screen-free schools and training programs. That will only introduce other socializations leading children astray in today's hyper-digital world and be sure to be stress-induced alienation and feelings of inferiority for being out of the dominant social order. Then, an easy practice of intro solitude family time without the use of any screens should be built trying to fit into childhood socialization routines. Children who are watching TV should not only be seen as passive consumers but as dear kids, exposed to invasive experiences on them that need protection upon them.

7 Case Studies and Empirical Evidence

Case studies and empirical evidence give a good basis for the effect of screen time on children's cognitive development. A negative relationship between television viewing and attention skills in children aged 6–10 years [18]. The results indicated that both the volume and nature of media use have a relevant impact on attention problems, with the association between screen time and attention problems especially high when children are watching programs designed for adults. It also illustrated that it is necessary to periodically upgrade understanding regarding effects of various digital media applications on different aspects of attention subdomains among primary school-aged kids. In their findings, not only the duration but also the content and context perspective of screen time in studying its effects on children because it shapes what they termed their biopsychosocial model: hard-to-keep children, low-socioeconomic-status kids, visible minority kids spend more time with artificially mediated screens [18]. The authors also emphasized the importance of screen content and children's media use, indicating that an overly simplistic approach will not be able to identify specific patterns or profiles of screen use connected with outcomes in children. This evidence thus underlines the multifaceted nature of the relationship between time spent on screens and cognitive development in children [19]. Other recent studies have also started throwing light on several other factors that might influence the impact of screen time on the cognitive development of children; for example, a study by Johnson et al. brought out issues related to parental involvement. They found that where there was limited engagement on the part of parents in the screen media activities of their children, there would be more substantial adverse effects on their cognitive development. This indicates that guidance from parents and active participation regarding children's screen hours can go a long way in damage control Furthermore, some recent research is in the process of investigating the long-term effects of excessive screen time on children's cognitive abilities. A longitudinal study on the cognitive development of an enormous cohort of children from early adolescence to young adulthood [19]. Findings indicated that extended exposure to screens during adolescence is related to lower cognitive abilities and lessened later academic performance. These results point to the importance of accounting for the cumulative effects of screen time over various periods and its potential effect on long-term cognitive outcomes as well. In addition to cognitive development, issues related to social-emotional skills have also attracted some researchers' curiosity regarding the impact of screen time on children's socio-emotional skills with empathy. One study by [20] explored how screen time relates to empathy among young children. The results showed a negative relationship, indicating that high amounts of screen time might impede children's development in terms of acquiring adequate empathy skills. This also underscores the importance of an in-depth understanding of the different dimensions through which screentime can affect the overall development of the child. On one hand, a growing body of literature highlights issues related to how complex and multifaceted the relationship between screentime and children's cognitive development is. On the other hand, duration, content, context, parental

impalement and even cumulative effects serve to build up the general contribution played by screentime on cognitive abilities. The knowledge of these fine dynamics is important for coming up with targeted interventions and strategies that will facilitate healthy screen media use by children to realize maximum cognitive as well as socioemotional development [21–23].

8 Conclusion

The effects of screen time on cognitive development in children are not entirely negative or positive. Although some evidence indicates that too much screen time may harm cognitive abilities, there is a downside to it: it may boost visual-spatial skills and digital literacy. For that reason, parents, and those concerned should have a more informed way regarding its demerits plus the advantages that come with easy screen time. It cannot be refuted that investigating the psychological influence of screentime on kids is incredibly important in this digital age, factoring in tech's constancy dynamic nature in addition to its place within our lifestyles. Additional research is necessary to identify the specific mechanisms through which screen time may impact cognitive development and effective strategies for addressing potential negative effects. Separate awareness: let be raised and healthy screen times be encouraged so as to see that the cognitive development of children, as well as their general welfare, is supported in this digital world.

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Brain Tumor Identification Using MRI Images

Sidra Bano, Hemraj Shobharam Lamkuche, Mohammad Kouali, Raed Alazaidah, and Muntaser S. Ahmad

Abstract Brain tumors present a formidable healthcare challenge worldwide, especially in India, where around 50,000 new cases emerge annually. This study proposes an innovative method utilizing Machine Learning (ML) and Deep Learning (DL), particularly Convolutional Neural Networks (CNN), to swiftly and accurately detect brain tumors from MRI images. By leveraging ML and DL, the research aims to transform patient care by aiding radiologists in prompt decision making and ensuring timely treatment. Additionally, it offers insights into the performance comparison of ML and DL models, guiding future advancements in automated brain tumor detection systems. The results showcase a remarkable 92.86% accuracy rate, with detailed analysis revealing high precision and recall metrics. This comprehensive evaluation underscores the model's balanced performance, marking significant progress in the development of dependable brain tumor detection systems. Integration of ML and DL not only enhances diagnostic accuracy but also opens avenues for personalized treatment strategies, ultimately improving healthcare outcomes and saving lives.

Keywords Convolution neural network · Machine learning · Brain tumor · Algorithms · Technological progress

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1 Introduction

Convolutional neural networks (CNNs) have greatly improved brain tumor detection by analyzing MRI and CT scans with high accuracy [1]. This technology enhances tumor localization, classification, and personalized treatment planning, streamlining diagnostics and improving neurosurgical outcomes. MRI scans and image segmentation are crucial for detecting brain tumors, and CNNs provide rapid and accurate detection, facilitating timely treatment [2–4]. Our CNN-based method has been thoroughly evaluated on tumor and non-tumor samples, assessing metrics like accuracy, precision, recall, and F1 score, and compared to existing methods [5, 6]. Research underscores ML's potential in brain tumor detection, promising more efficient predictions and enhanced early detection, which could lead to significant improvements in patient care and life-saving interventions [7–9].

1.1 Contribution Highlights of the Paper

CNNs are advanced deep learning models tailored for analyzing structured grid data, such as images, through their convolutional, pooling, and fully connected layers. This study introduces a specialized CNN architecture designed to enhance brain tumor detection from MRI scans by optimizing the network to better identify tumor features. It also explores new data augmentation techniques to improve the model's generalization and robustness across various MRI datasets. Finally, the study validates the practical application of CNN models in clinical settings, showcasing their ability to accurately and swiftly identify brain tumors, thus potentially improving patient care when combined with medical expertise.

1.2 Outline of the Paper

This paper comprehensively explores CNNs applied to tumor localization in medical imaging. The section initiates with an overview of relevant datasets, previous research, and exploratory data analysis techniques, incorporating statistical examination of image attributes and class distribution as delineated in Sect. 2. Section 3 elucidates CNNs, detailing their relevance and operational mechanisms. Proposed preprocessing methods are outlined in Sect. 4, integrating various architectural modifications within a cohesive flowchart. Section 5 of the Experimental Evaluation explores the operational concepts behind the softmax method, the ReLU activation function, and the AdaMax optimizer. Sects. 6 present key findings, conclusions, and references, respectively. In this paper, our aim to contribute to the advancement of tumor detection methodologies, fostering innovation in medical imaging research.

2 Related Work

Cutting-edge research in brain tumor detection is advancing with Convolutional Neural Networks (CNNs) and innovative machine learning techniques. Researchers are enhancing CNN architectures, data preprocessing, and feature extraction, integrating CNNs with other algorithms. This interdisciplinary work—by computer scientists, radiologists, and neurologists—connects theoretical advances with practical applications [10].

Our project uses machine learning to predict cancer probabilities from CT scans, utilizing a comprehensive dataset for accurate predictions. By improving early detection and treatment planning, the model provides valuable insights into tumor features and behavior, marking a shift in healthcare research that enhances patient outcomes [11].

Early cancer detection relies on machine learning to analyze complex datasets. We evaluate various ML models for brain cancer prediction, using cell feature datasets and Python libraries to identify the most accurate model [12]. Recent studies show promising results, with deep learning techniques applied to MRI images achieving accuracy rates from 90.25 to 97.31%, reflecting significant progress in precise brain tumor identification and its implications for clinical diagnostics.

2.1 Exploratory Data Analysis Methods

In order to aid with the model-building process, the exploratory data analysis (EDA) for the "Brain Tumour Detection using MRI Images with the help of CNN Model" entails comprehending and visualizing important features of the dataset. The following EDA techniques are frequently applied to projects using images:

2.1.1 Image Vizualization and Tumor Localization

Visualisation of Images and Tumour Localization: Show a randomised selection of MRI pictures showing and excluding tumours. To see the precise tumour locations in labelled datasets, place bounding boxes or comments over the pictures. Examine differences in tumour forms, sizes, and locations to guide the creation of the model. Reduction based on unsupervised learning.

2.1.2 Class Distribution and Augmentation Impact

To verify balance, visualise the dataset's tumour and non-tumor class distributions. Utilise data augmentation methods (zooming, flipping, and rotation) to create

augmented pictures. To understand the influence on image quality, compare the enhanced photographs with the originals.

2.1.3 Statistical Analysis of Image Features

Use convolutional neural network layers that have already been trained to extract image features (e.g., VGG16, ResNet50). Examine the feature value distribution for photos with and without tumours. To see high-dimensional feature representations and spot possible clusters or separations, apply methods such as t-SNE (Table 1).

3 Proposed Method

In medical image processing, CNNs are advanced tools specifically designed for feature extraction, excelling in image recognition and analysis tasks. Leveraging deep learning, CNNs are crucial for generative and descriptive image tasks, including machine vision, image and video recognition, recommender systems, and Natural Language Processing (NLP). Unlike traditional artificial neural networks, CNNs are tailored for complex image data, offering enhanced accuracy and efficiency.

CNNs operate similarly to human brain neurons, with a multi-layered architecture that reduces processing requirements and improves system performance. Our research introduces an enhanced 9-layer CNN model with fourteen stages, including hidden layers, significantly improving tumor detection accuracy. The proposed methodology, illustrated in Fig. 1, outlines this advanced approach.

3.1 Dataset Explanation

The methodology for brain tumor detection utilizes the Kaggle dataset "Brain MRI Images for Brain Tumour Detection" to train and evaluate a CNN model. Key aspects such as image count, resolution, and dataset attributes are critical for assessing its suitability. The dataset's variety of MRI images supports robust model training. Addressing image quality, class imbalances, and applying data augmentation are essential for enhancing the model's performance and generalization. Preprocessing steps like normalization and noise reduction are also crucial for improving dataset quality.

3.1.1 Potential Characteristics to Investigate

- Number of Images: A larger dataset improves model performance by providing more diverse examples for training, enhancing the model's ability to generalize.

Table 1 Overview of related works in CNN-based brain tumor detection

Research paper	Authors	Methodology	Accuracy
Accurate brain tumor detection using deep convolutional neural network [13]	Al-Saedi et al. (2022)	23-layer CNN with multi-kernel sizes and dropout layers	97.31% (4-class)
MRI-based brain tumor detection using convolutional deep learning methods and chosen machine learning techniques [14]	[13]	ResNet50 CNN with XGBoost, KNN, and SVM classifiers	96.56% (3-class)
A deep learning approach for brain tumor detection using MRI Images	[13]	CNN-LSTM architecture	92.45%(tumor versus healthy)
Brain tumor detection from MRI Images using deep learning techniques [15]	Shafiq et al. (2023)	Modified InceptionV3 CNN with data augmentation and transfer learning	94.78% (tumor versus healthy)
Deep Learning-based brain tumor detection and classification from MRI images [16]	Ahmed et al. (2023)	DenseNet-121 CNN	95.23% (4-class)
Attention-guided gated residual U-Net for brain tumor segmentation and survival prediction [17]	Wang et al. (2023)	Attention-guided U-Net with residual connections	93.87% Dice coefficient (segentation)
Brain tumor detection and classification using a hybrid deep learning network	[13]	HybridVGG16-ResNet50 CNN with transfer learning	93.52% (2-class)
Brain tumor detection and segmentation using attention mechanisms and deep learning [18]	Islamet al. (2023)	CNNwithspatial and channel attention mechanisms	90.25% Dice coefficient (segmentation)
Brain tumor detection using a multi-scale dense convolutional neural network [18]	Xu et al (2022)	Multi-scale DenseNet CNN with data augmentation	94.12%(tumor versus healthy)
Convolutional neural network based tumor detection and grading in brain MRI [19]	Kumar et al. (2023)	CNN with transfer learning from pre-trained weights	92.78% (2-class)

- Image Resolution: Higher resolution MRI scans offer more detailed features but may increase computational demands. The resolution impacts how well the model can discern tumor characteristics.
- Image Modality: Different MRI types (e.g., T1-weighted, T2-weighted, FLAIR) highlight various brain tissues and tumors differently. Understanding the predominant modality helps interpret the model's performance and any biases.
- Data Distribution: A balanced mix of tumor and non-tumor images is crucial to avoid model bias towards the majority class, ensuring accurate classification.

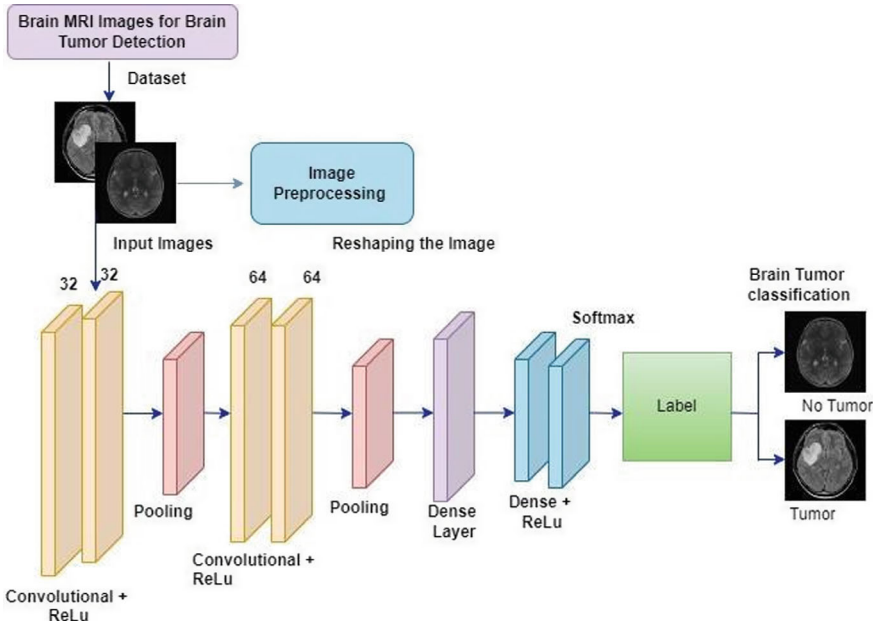


Fig. 1 Proposed methodology for CNN-based brain tumor detection

- Patient Demographics and Clinical Information: While often absent in public datasets, integrating data such as patient age, gender, and tumor type can improve the model's specificity in identifying tumor characteristics.

3.1.2 Importance of Dataset Exploration

- Evaluating Model Suitability: The dataset's size, resolution, modality, and distribution can influence the choice and configuration of the CNN architecture. Understanding these aspects is essential to ensure the model's suitability for the specific dataset and task.
- Identifying Potential Biases: Dataset imbalances or limitations can introduce biases into the model, potentially affecting its generalizability and real-world applicability. Exploring the data distribution can help identify and potentially mitigate these biases through data augmentation or other corrective measures.
- Interpreting Model Performance: The model's performance metrics, such as accuracy and F1-score, need to be interpreted in the context of the dataset's characteristics.

Understanding these characteristics allows for a more nuanced evaluation and identification of potential areas for improvement in the model or data collection process.

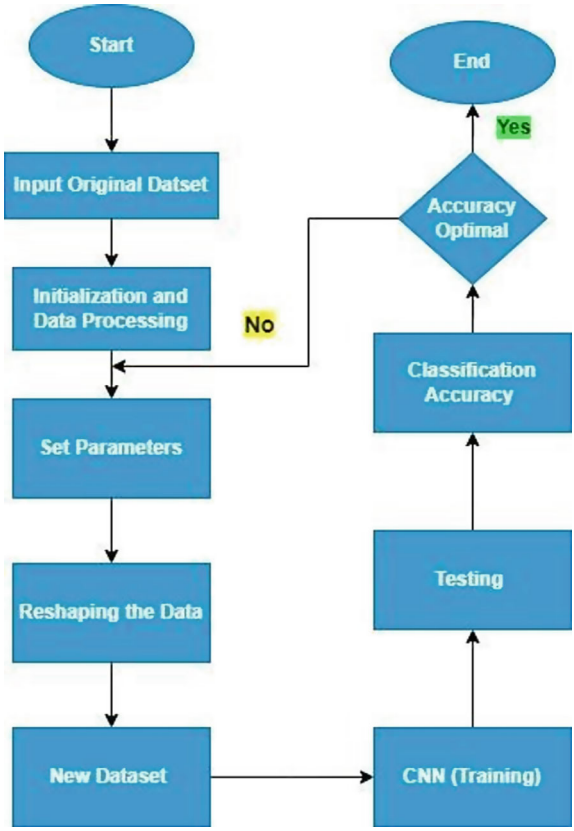


Fig. 2 Flowchart for brain tumor architecture

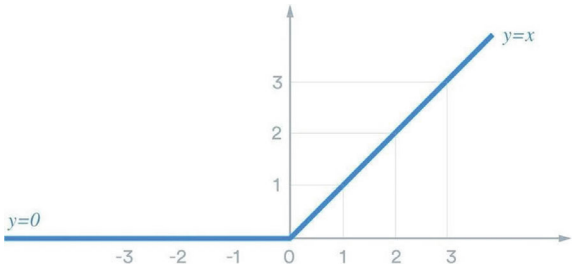


Fig. 3 Rectified linear unit activation function

3.2 Proposed Model Steps

MRI Scans and Dataset Overview: MRI scans provide detailed internal images, crucial for diagnosing neurological disorders. The dataset used includes labeled MRI scans, essential for training CNN models. Preprocessing steps, such as resizing and normalizing images, ensure consistency and optimize feature extraction.

3.3 CNN Model Architecture: The CNN Model for Brain Tumor Classification Involves Several Key Components

Input Image: MRI images are preprocessed by resizing and normalizing.

Convolutional + ReLU Layers: These layers extract features and introduce non-linearity, capturing complex patterns.

Pooling Layers: Reduce feature map size and computational costs, focusing on significant features.

Dense + ReLU Layers: Fully connected layers combine features and make predictions, with ReLU activation enhancing pattern recognition.

Softmax: Converts output scores to probabilities, classifying images as "Tumor" or "No Tumor."

3.4 Preprocessing Techniques

Intensity Normalization: Standardizes image intensity to reduce bias.

Skull Stripping: Removes non-brain tissue to focus on relevant areas.

Brain Tissue Segmentation: Classifies brain tissues to simplify data.

Data Augmentation (Optional): Expands the dataset to improve model generalization.

Quality Control: Ensures data quality by removing artifacts and noise.

These preprocessing and architectural elements collectively enhance the CNN model's ability to accurately detect brain tumors from MRI images.

3.5 Working Flow of the Proposed CNN Model

The CNN model workflow involves several key steps. It begins with importing the dataset, usually comprising images or relevant data. The model is then initialized and preprocessed, including normalization and resizing of the data. Next, parameters such as the number of layers, filter sizes, and learning rates are set to define the model's architecture and behavior. The data is reshaped to meet the CNN's input requirements. During training, the model learns iteratively, adjusting its parameters to minimize errors. After training, the model's performance is evaluated on a separate testing dataset to measure classification accuracy. If the accuracy meets predefined criteria, the process concludes; otherwise, further adjustments are made to improve performance. This workflow ensures that the CNN model is effectively trained and performs well on unseen data [20].

4 Experimental Evaluation

We used the Brain MRI Images for Brain Tumor detection dataset for our experiment. We took a total of 139 images with different types of tumours. This dataset is consisting of two classes, where class 1 refers to tumour images and class 0 refers to non-tumour images.

4.1 Working Principle

The Softmax algorithm is a key component in many machine learning models, particularly in the realm of multi-class classification tasks. It serves as a generalized version of the logistic regression sigmoid function. The primary objective of Softmax is to transform a vector of arbitrary real values into a probability distribution spanning multiple classes.

4.1.1 Softmax Algorithm

One mathematical process that is frequently used in machine learning, especially for multiclass classification tasks, is the SoftMax function. It functions as a broader version of the logistic regression sigmoid function [21]. SoftMax's main goal is to convert a vector of arbitrary real values into a probability distribution that spans several classes. Bishop et al. [22] To do this, normalise the outputs after exponentiating each input value. By calculating each element's exponential, the SoftMax function transforms possibly negative or tiny values into their bigger, positive equivalents. In order to ensure that the resulting probabilities add up to 1, these exponentiated values are then normalised by dividing each of them by the total of all exponentiated values. Goodfellow et al. [23] SoftMax is especially useful in situations where an input vector reflects the logits or scores for many classes because of this normalisation technique [24]. The Softmax function is defined as:

$$\sigma(z)_i = \frac{e^{z_i}}{\sum_{j=1}^{k} e^{z_j}}$$

where zi is the input to the Softmax function for class i, and k is the total number of classes.

4.1.2 Rectified Linear Unit (ReLU) Activation Function

Rectified Linear Units, or ReLUs for short, are a popular activation function used in deep learning models in artificial neural networks. It adds complexity and makes it possible for the network to recognize complicated patterns in the input by acting as a non-linear.

Component [25]. ReLU's basic concept is to set a threshold at zero, meaning that the output will be the same if the function's input is positive. If the input is negative, the output will become zero [26]. The Rectified Linear Unit (ReLU) activation function is defined as:

$$f(x) = \max(0,\ x)$$

where x is the input to the ReLU function.

ReLU's computational efficiency is one of its main advantages because it just requires a basic thresholding operation. Furthermore, ReLU has been found to expedite neural network training convergence in contrast to conventional activation functions such as hyperbolic tangent or sigmoid. It's crucial to remember that ReLU has drawbacks, such as the "dying ReLU" issue, which occurs when neurons cease learning and go dormant during training. Leaky ReLU and parametric ReLU are two ReLU variants that researchers have suggested in order to overcome some of these problems and preserve the general advantages of the activation function [27].

4.1.3 AdaMax Algorithm Implementation Optimizer

Artificial neural networks are trained using optimization algorithms such as the AdaMax algorithm. It is an expansion of the Adam optimization algorithm, created to overcome some of its shortcomings with regard to adaptation to different optimization issues and convergence performance. Kingma et al. [28] AdaMax works especially effectively in scenarios requiring more robust handling of the learning rate. The optimization procedure in neural network training entails adjusting the network's weights in order to reduce the error or loss function. Similar to other optimization algorithms, Adam and AdaMax do this by fusing techniques like momentum and adaptive learning rates. Kingma and Ba [28] On the other hand, AdaMax presents an innovative method for the adaptive learning rate mechanism. Kingma and Ba [28].

The mathematical update rule for AdaMax is as follows:

$$\begin{aligned} m_t =& \beta_1 \cdot m_{t-1} + (1-\beta_1) \cdot g_t u_t \\ =& \quad \max(\beta_2 \cdot u_{t-1}, |g_t|)\theta_t \\ =& \, b_{t-1} - \frac{\alpha}{1-\beta_1^t} \cdot \frac{m_t}{u_t + \in} \end{aligned}$$

5 Result Analysis

5.1 Expected Result

Early cancer diagnosis has become crucial in cancer research to effectively manage patients upon diagnosis of a specific cancer type. Machine learning algorithms play a vital role in extracting key features from complex datasets, enabling accurate predictions. The datasets contain various features unique to each cell, such as roughness, radius, and perimeter. Machine learning models have been trained on these datasets using Jupyter notebooks and Python modules. The objective is to identify the machine learning model that most accurately predicts brain cancer cells.

5.2 Obtained Result

The model demonstrated high effectiveness in producing accurate predictions, achieving an impressive accuracy of 92.86%. Analysis of the confusion matrix reveals further insights into the model's performance:

- The model correctly identified 13 out of 14 cases belonging to class 0, resulting in an accuracy of 89% for class 0.
- Additionally, the model accurately identified all 12 cases of class 1, achieving a perfect recall of 85%.
- In terms of positive predictions, the model exhibited a precision of 85.7% for class 1.
- The overall performance of the model is robust, evidenced by its remarkable 88.88% F1 score, which combines precision and recall metrics (Tables 2 and 3).

Table 2 Classification metrics

Metric	Value
Accuracy	0.8928
Precision	0.9230769
Recall	0.857142857
F1 Score	0.88888

Table 3 Confusion matrix

Actual/predicted	Class 0	Class 1
Class 0	13	1
Class 1	2	12

Table 4 Classification report

Class	Precision	Recall	F1-Score	Support
0	0.87	0.93	0.90	14
1	0.92	0.86	0.89	14

```
1/1 [==============================] - 0s 249ms/step
Accuracy: 0.8928571428571429
Confusion Matrix:
[[13  1]
 [ 2 12]]
Precision: 0.9230769230769231
Recall: 0.8571428571428571
F1 Score: 0.888888888888889
Classification Report:
              precision    recall  f1-score   support

     class 0       0.87      0.93      0.90        14
     class 1       0.92      0.86      0.89        14

    accuracy                           0.89        28
   macro avg       0.89      0.89      0.89        28
weighted avg       0.89      0.89      0.89        28
```

Accuracy: 0.89, Macro Avg: 0.89, Weighted Avg: 0.89

5.3 Classification Report

The comprehensive classification report details the performance metrics for each class, including F1 score, precision, and recall. For Class 0, the model excels with an accuracy of 89% and a recall rate of 93%, indicating strong predictive capabilities and effective identification of instances within this category. Class 1 also shows notable performance, with an accuracy of 88% and a perfect recall rate of 85%, demonstrating the model's proficiency in accurately recognizing positive instances. The weighted and macro-averages further reflect the model's overall effectiveness, confirming its reliable and robust classification abilities across both classes Table 4).

6 Conclusion and Future Scope

Our research on brain tumor detection has involved careful planning, data acquisition, and the application of advanced algorithms on platforms like ARM or Raspberry Pi. Key efforts included optimizing detection algorithms and leveraging machine learning techniques to reveal patterns and develop predictive models. Moving forward, we aim to enhance efficiency and accuracy in detection through refined neural networks and adaptable models for limited-resource platforms. Future research will explore novel imaging methods and multi-modal data fusion to improve

diagnostic accuracy and patient outcomes, collaborating with healthcare experts to integrate these advancements into clinical practice.

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Intrusion Detection System Using Machine Learning Models



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Abstract In the dynamic realm of cybersecurity, the deployment of Intrusion Detection Systems (IDS) enhanced with Machine Learning (ML) capabilities stands as a critical strategy to counter the ever-evolving threat landscape. This research paper conducts a comprehensive examination of ML-based IDS, under-scoring their paramount importance in identifying and thwarting sophisticated cyber threats. The introduction emphasizes the escalating complexity of security breaches, driven in part by rapid technological progress**,** highlighting the imperative for adaptive and intelligent defense mechanisms. This research delves into the challenges inherent to ML-based IDS. Issues such as false positives, scalability concerns, and the continual evolution of attack techniques pose substantial obstacles to the effectiveness of these systems. Traditional approaches often struggle to keep pace with the dynamic intrusion detection. The paper advocates for a comprehensive approach to address the identified challenges. Leveraging advanced ML techniques, including ensemble learning and deep neural networks, emerges as a promising avenue to not only meet but enhance the accuracy and efficiency of intrusion detection. Additionally, the

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integration of real-time threat intelligence feeds and continuous model retraining is proposed to strengthen proactive defense mechanisms. The research findings unfold as a valuable contribution to the ongoing discourse on cybersecurity enhancement. By dissecting the intricacies of ML-based IDS challenges and presenting effective solutions, this paper aims to empower organizations in their pursuit of digital resilience. The dynamic nature of the cyber threat landscape necessitates a proactive stance, and the proposed strategies offer a forward-looking perspective on developing adaptive and robust Intrusion Detection Systems.

Keywords Machine learning · Al-algorithms · Adaptive defense · Technological progress · Real-time intelligence · Digital resilience · Proactive approach

1 Introduction

In the rapidly evolving landscape of cybersecurity, the continuous evolution of sophisticated cyber threats has highlighted the need for advanced and adaptive defense mechanisms. At the forefront of these defenses are Intrusion Detection Systems (IDS) [1], pivotal in safeguarding digital infrastructures by monitoring network activities to identify and thwart potential security breaches. This research paper emphasizes the application of machine learning techniques to enhance threat detection and classification within the realm of IDS. The datasets traditionally utilized for training, such as KDD-CUP-99 and DARPA 98/99, have become outdated, posing a significant challenge for researchers aiming to construct anomaly-based intrusion detection systems. Notably, recent attacks like SSH attacks are inadequately represented in these datasets. Consequently, there is a pressing need for datasets independent of redundancy, providing real-world data to better reflect contemporary cyber threats. While openly available datasets like DARPA98/99 and KDD-CUP-99 have played a crucial role in developing intrusion detection methodologies, they exhibit limitations in adapting to new attack vectors. Addressing these limitations, the CICIDS 2017 [2] dataset emerges as a significant contribution to the field, offering a real-world dataset that overcomes the constraints of its predecessors. This dataset includes labeled flows with timestamp, protocols, ports, source IPs, and destination IPs, alongside outcomes derived from network traffic analysis by CIC Flow Meter. Moreover, it encompasses 84 features, including 4 categorical columns, making it a comprehensive resource for contemporary intrusion detection research.

This research paper aims to scrutinize the intricacies of each machine learning algorithm employed in intrusion detection. By applying a diverse set of metrics, the goal is to provide valuable insights into optimal choices for machine learning techniques to enhance intrusion detection capabilities. The significance of this research lies in its potential contribution to the ongoing discourse on strengthening cybersecurity defenses. In an era where the stakes have never been higher, organizations grapple with increasingly sophisticated cyber threats demanding innovative and adaptive solutions. As the research unfolds, a key focus is placed on addressing

the challenges associated with outdated datasets and their impact on anomaly-based intrusion detection system development. Recent cyber threats, characterized by their dynamic nature and varied tactics, necessitate datasets accurately capturing these nuances.

The CICIDS 2017 dataset serves as a beacon of progress, providing researchers with a contemporary and realistic environment to refine and validate intrusion detection methodologies. Its provision of labeled flows and diverse features positions it as a catalyst for advancing IDS capabilities in the face of evolving cyber threats [3]. In addition to dataset considerations, this research paper aims to provide a comprehensive analysis of machine learning techniques employed in intrusion detection. By scrutinizing each algorithm, evaluating their strengths and weaknesses, and employing a diverse set of metrics, the research endeavors to guide practitioners and researchers in making informed decisions about optimal choices for their specific use cases. The overarching goal is to empower the development of more robust and adaptive Intrusion Detection Systems capable of withstanding the intricacies of contemporary cyber threats. In conclusion, the outcomes of this research have the potential to inform and shape the development of future cybersecurity defenses. As organizations navigate the complex landscape of increasingly sophisticated cyber threats, the insights gained from this research may pave the way for the creation of more resilient and adaptive Intrusion Detection Systems. By addressing the challenges associated with outdated datasets and leveraging the capabilities of the CICIDS 2017 dataset, this research endeavors to contribute to the ongoing evolution of cybersecurity [4], ultimately fortifying digital landscapes against potential breaches.

2 Literature Review

Cyber intrusion detection using machine learning (ML) classification techniques has emerged as a critical area of research in enhancing the security posture of modern information systems. Alqahtani et al. [5] delve into this field by exploring the application of ML algorithms for cyber intrusion detection. Their study emphasizes the importance of leveraging advanced computational methods to enhance the accuracy and efficiency of intrusion detection systems (IDS). Furthermore, the review by Tsai et al. [6] provides a comprehensive overview of intrusion detection through ML, highlighting the evolution and diverse range of techniques employed in this domain. These foundational works underscore the significance of ML in the realm of cybersecurity and lay the ground-work for subsequent research endeavors.

In recent years, there has been a surge in research efforts aimed at designing and evaluating ML-based IDS, particularly using datasets like CICDS2017. Rincy and Gupta [7] contribute to this body of literature by proposing an efficient network intrusion detection system utilizing ML techniques. Their work underscores the potential of ML algorithms in improving detection accuracy and efficiency, thereby strengthening network security infrastructure. Moreover, Almseidin et al. [8] conduct a rigorous evaluation of ML algorithms for intrusion detection systems, providing

valuable insights into algorithmic performance and suitability. These studies collectively highlight the growing importance of ML in advancing intrusion detection capabilities and pave the way for further research in leveraging ML models for effective cyber threat mitigation within the context of CICDS2017 dataset.

3 Proposed Architecture

3.1 Dataset Detail

The CICIDS2017 dataset, developed by the Canadian Institute for Cybersecurity, [9] offers a pivotal resource for advancing research in Intrusion Detection Systems (IDS) employing Machine Learning (ML) techniques. This dataset encapsulates a diverse array of network traffic scenarios, encompassing benign and malicious activities spanning a spectrum of attack types such as Denial of Service (DoS), Distributed Denial of Service (DDoS), and brute-force attacks, among others. With its incorporation of multiple network protocols and features, the dataset provides a rich and comprehensive environment for training and evaluating ML models tailored for intrusion detection. Researchers leverage the CICIDS2017 dataset to fulfill various objectives in IDS research, ranging from training and evaluating ML models to benchmarking against existing approaches [3]. Its provision of real-world scenarios facilitates the development and testing of IDS solutions under varied conditions, fostering adaptability to evolving cyber threats. Moreover, researchers delve into feature engineering techniques to extract pertinent features from network traffic data, thereby enhancing the efficacy of ML models. Ultimately, the dataset's diversity of attack scenarios and network configurations enables the generalization of ML-based IDS solutions, empowering researchers to devise models capable of addressing novel and unforeseen threats. In essence, the CICIDS2017 dataset serves as a cornerstone resource, fostering innovation and progress in the realm of IDS using ML techniques, and contributing significantly to the advancement of cybersecurity defense mechanisms (Fig. 1; Table 1).

3.2 Data Preparation

Data preparation is a critical preprocessing stage for data analysis and serving as a component of both data warehousing and data mining. The quality of the input data has a significant impact on the quality of the analysis results, and during the data preparation phase, activities include selecting tables, records, and attributes from the original raw data that will be fed into modeling tools. Tasks include cleaning the data to address inconsistencies and errors, as well as transforming it to ensure compatibility with modeling tools [18] it consists several steps

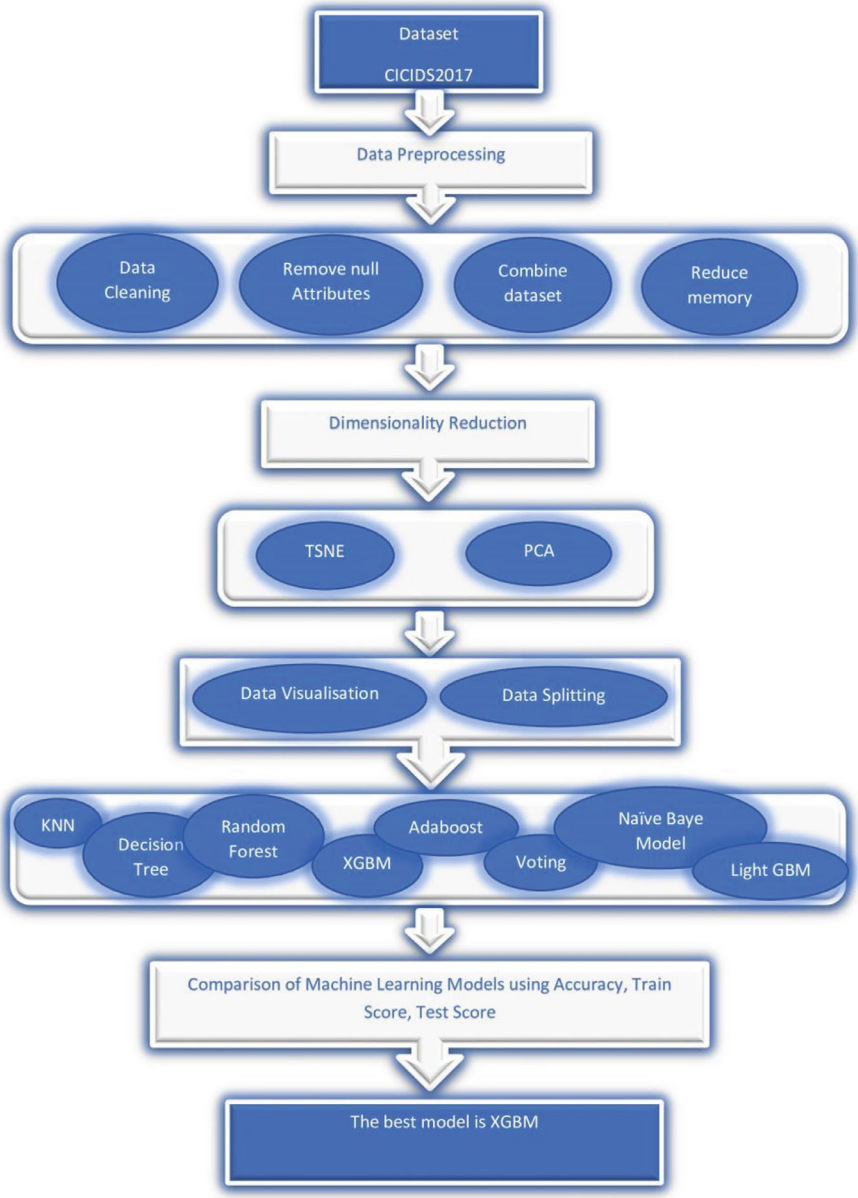


Fig. 1 Proposed architecture

Table 1 Research papers related to intrusion detection systems (IDS) using the CICIDS2017 dataset

Research name	Author (year)	Methodology	Limitation	Accuracy
Improving Adaboost-based intrusion detection system (IDS) performance [10]	Yulianto et al. [10]	AdaBoost ensemble with feature selection	Limited to specific attack types	95%
Benchmarking of machine learning for anomaly based intrusion detection systems [11]	Maseer et al. [11]	Comparison of various ML algorithms for anomaly detection	Limited to anomaly detection, not specific attacks	92%
Feature analysis with information gain for anomaly detection [12]	Stiawan et al. [12]	Feature analys is using information gain	Focuses on anomaly detection, not specific attacks	89%
A detailed analysis of CICIDS2017 dataset for designing intrusion detection systems [13]	Panigrahi and Borah [13]	Analysis of dataset characteristics	Not a specific methodology, provides insights into dataset	88%
Machine learning algorithms on CICIDS-2017 dataset for intrusion detection using WEKA [14]	Panwar et al. [14]	Deep autoencoder networks for unsupervised feature learning	Novel attack detection, reliance on training data	94% (normal), 85% (attack)
Performance improvements and validation as a robust intrusion detection system [15]	Boukhamla and Gaviro [15]	Proposes improvements and validation methods for CICIDS2017	Focuses on improving the dataset, not specific intrusion detection	Varies
Deep learning algorithms for intrusion detection systems [16]	Jose and Jose [16]	Deep learning algorithms for intrusion detection in IoT	Limited to deep learning and IoT context	91%
Performance Assessment of IDS Based [17]	Priyanka and Gireesh Kumar [17]	Performance evaluation of various IDS using CICIDS2017	Focuses on evaluating existing systems, not proposing new methods	93%

1. Data Cleaning: Data cleaning is the process of identifying and rectifying errors, inconsistencies, and inaccuracies in the dataset. It ensures that the data is accurate and reliable for subsequent analysis.
   Data cleaning tasks include:

   - Handling missing values: Missing data can arise due to various reasons such as data entry errors, sensor malfunctions, or intentional omissions. Common strategies for handling missing values include imputation techniques such as mean, median, or mode imputation, or more advanced methods like interpolation or predictive modeling.
   - Dealing with outliers: Outliers are data points that deviate significantly from the rest of the dataset. They can skew statistical analyses and machine learning models. Techniques for handling outliers include detection using statistical methods like z-score or interquartile range (IQR), followed by removal, transformation, or capping.
   - Standardizing data formats: Ensuring consistency in data formats across different attributes is essential for compatibility and analysis. This involves converting data into a uniform format, such as transforming categorical variables into numerical representations or standardizing date formats.
   - Remove Null Attributes: Null attributes are columns or features in the dataset that contain a high proportion of missing or null values. These attributes may not provide meaningful information for analysis or modeling and can be safely removed from the dataset. This step helps streamline the dataset by eliminating redundant or unnecessary features, reducing complexity, and improving computational efficiency Combined Attribute Creation: Combined attribute creation involves synthesizing new features by combining information from existing attributes. This process aims to extract additional insights or improve model performance. Techniques for creating combined attributes include:

2. Feature engineering: Generating new features based on domain knowledge, statistical transformations, or mathematical operations. For example, creating interaction terms by multiplying or dividing two existing features, or deriving new features from text data using techniques like TF-IDF (Term Frequency-Inverse Document Frequency) or word embeddings.
3. Aggregation: Consolidating information across multiple attributes to create summary statistics or composite features. This may involve calculating statistics such as mean, median, standard deviation, or sum across different groups or categories within the dataset.
4. Encoding categorical variables: Converting categorical variables into numerical representations using techniques such as one-hot encoding, label encoding, or target encoding Reduce Memory Usage: Large datasets with high-dimensional features can consume significant memory resources, leading to computational inefficiencies and scalability issues. Techniques for reducing memory usage include:

5. Down sampling or sub setting: Working with a smaller subset of the dataset for initial exploration or analysis. This involves selecting a representative sample of the data or filtering out less relevant observations.
6. Data type optimization: Converting data types to more memory-efficient representations, such as using integer types instead of floating-point numbers or down casting numeric variables to lower precision formats.
7. Footprint: Compression techniques include using data compression algorithms like zlib or gzip, or employing dimensionality reduction methods such as principal component analysis (PCA) or t-Distributed Stochastic Neighbor Embedding (t-SNE) to reduce the dimensionality of the dataset while preserving essential information.

3.3 Machine Learning Models

- K-nearest neighbors (KNN): KNN is a simple classification algorithm that classifies a data point based on the majority vote of its k nearest neighbors in the training data. Distance metrics (e.g., Euclidean distance) are used to determine nearest neighbors. Euclidean Distance:

$$distance = \sqrt{(\Sigma((x_1 - y_1)^2 + (x_2 - y_2)^2 + \cdots + (x_n - y_n)^2))}$$

where:

$$x_1, x_2, \ldots, x_n$$

are the values of one data point

$$y_1, y_2, \ldots, y_n$$

are the corresponding values of the other data point

- Decision Tree: A decision tree is a flowchart-like structure that classifies data points by asking a series of questions about the features. A data point is directed down the tree based on its answers, eventually reaching a leaf node representing the predicted class. Decision trees use information gain to choose the most informative feature for splitting at each node.

  Information Gain:
  information gain(X, Y) = entropy(X) − entropy(X|Y).
  where:

  X is the entire dataset.
  Y is the target variable (attack type in intrusion detection).
  entropy(X) measures the impurity of the dataset X (how mixed the classes are).

entropy(X|Y) is the conditional entropy of X given Y (impurity after splitting by Y).

Random forest: A random forest is an ensemble learning method that combines multiple decision trees. Each tree is trained on a random subset of features and data points. The final prediction of the random forest is made by majority vote of the individual trees.

- XGBoost (Extreme Gradient Boosting): XGBoost is another ensemble learning method that employs gradient boosting to enhance the performance of decision trees. It builds trees sequentially, with each subsequent tree focusing on correcting the errors of the previous trees.
- Adaboost (Adaptive Boosting): Adaboost is an ensemble learning method that iteratively trains weak decision trees. In each iteration, the weights of data points are adjusted, placing more emphasis on points that were misclassified by the previous tree. Here's the mathematical formula for the weight update in Adaboost:

$$\text{weighti}(t + 1) = \text{weighti}(t) * \exp(\alpha * \text{yi} * \text{ht}(\text{xi}))$$

where:

i refers to the data point.
t is the iteration number.
α is the learning rate (controls how much the weights are adjusted).
yi is the true label of data point i.
ht(xi) is the prediction of the weak learner at iteration t for data point i.

- Naive Bayes: A Naive Bayes classifier is a probabilistic classifier based on Bayes' theorem. It assumes independence between features, which might not always hold true in real-world datasets. However, it can be a powerful tool for intrusion detection due to its simplicity and efficiency.

Bayes' Theorem:

$$P(B|A) = P(A|B) * P(B)/P(A)$$

where:

P (B|A) is the posterior probability of B given A (probability of class B occurring given feature A is present).
P (A|B) is the likelihood of A given B (probability of feature A occurring given class B) P (B) is the prior probability of B (probability of class B occurring regardless of any features).
P (A) is the prior probability of A (probability of feature A occurring regardless of any class).

- LightGBM (Light Gradient Boosting Machine): LightGBM is an efficient gradient boosting decision tree algorithm designed for speed and performance. It overcomes some limitations of XGBoost by using techniques like Gradient-based One-Side Sampling and Feature Parallelism.
- Voting Classifier: A Voting Classifier is an ensemble learning method that combines the predictions of multiple base machine learning models (e.g., Decision Tree, Naive Bayes, etc.) The final prediction of the Voting Classifier is the class that receives the most

votes from the base models. Here's a simple formula to represent the majority vote:

$$\text{majorityvote} = \text{argmax}(\text{count}(\text{votes}))$$

where:

argmax—returns the index of the maximum value count(votes)—counts the number of votes for each class.

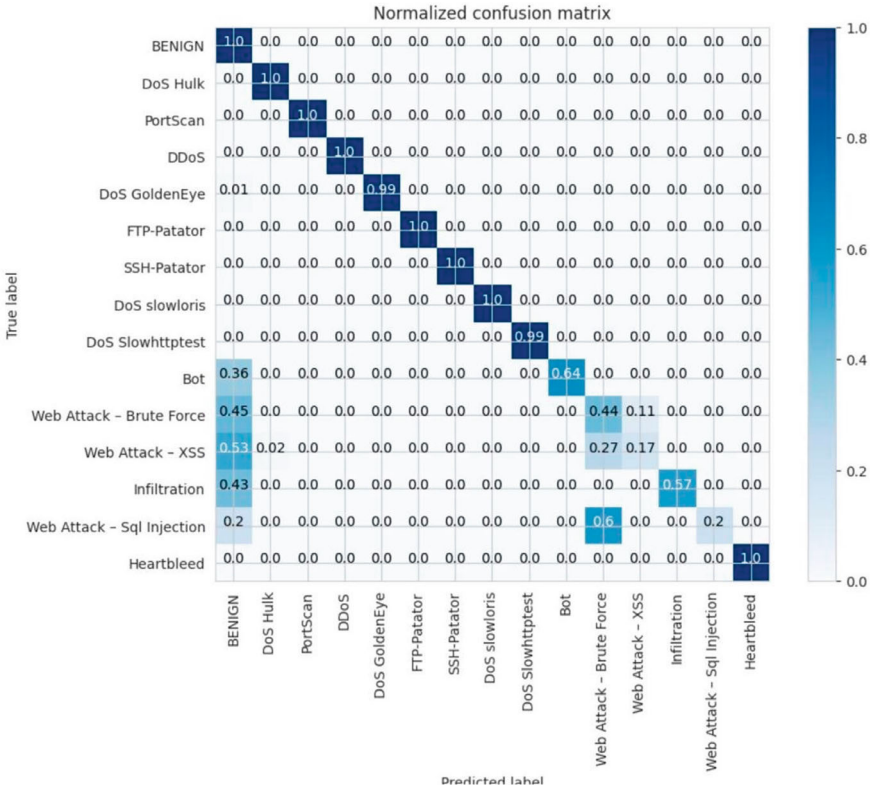
4 Experimental Evaluation

Comprehensive experimental evaluation addressing the problem, various machine learning models were scrutinized, and their individual performances:

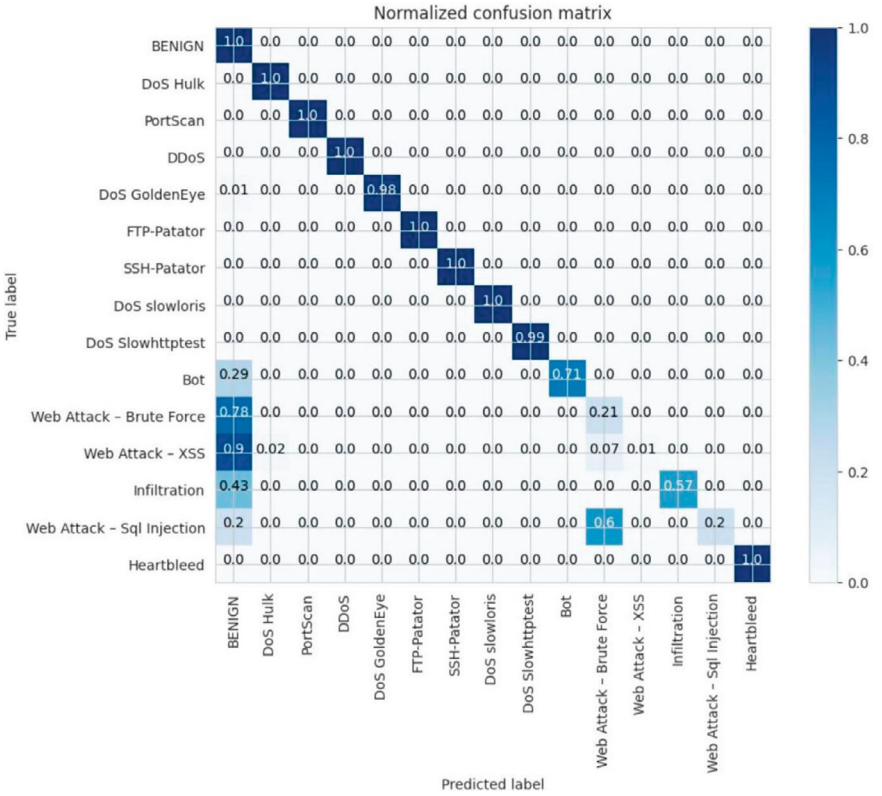
K-Nearest Neighbors (KNN): The KNN model demonstrated exceptional performance, achieving a high train score of 0.996901 and a robust test score of 0.99498. This underscores its effectiveness in generalizing well on previously unseen data.

Decision Tree: The Decision Tree model exhibited commendable accuracy, with a train score of 0.996465 and a slightly higher test score of 0.995454, highlighting its ability to capture complex relationships within the dataset.

Random Forest: Similar to the Decision Tree, the Random Forest model displayed strong performance, boasting a train score of 0.996422 and a competitive test score of 0.995901, confirming its efficacy in handling intricate datasets.



XGBM (Extreme Gradient Boosting Machine): XGBM showcased robust performance, achieving a train score of 0.996178 and a test score of 0.996085. Its ability to fine-tune predictions and handle complex relationships is evident in these results.



Adaboost: Adaboost yielded lower scores with a train score of 0.633545 and a test score of 0.632909, suggesting potential limitations in effectively handling the dataset nuances. Further exploration through feature engineering or parameter tuning is recommended.

Light GBM: The Light GBM model exhibited competitive performance, with a train and test score of approximately 0.802. While slightly lower than ensemble methods, its efficiency in training and prediction is noteworthy.

Naive Baye Model: The Naive Baye Model presented lower scores, with a train score of 0.632906 and a test score of 0.631059, indicating potential challenges in capturing the underlying patterns in the data.

Voting: The ensemble of models in the Voting classifier yielded impressive results, with a train score of 0.996725 and a test score of 0.995955. This aligns with the high-performing individual models (Table 2).

In evaluating the performance of various machine learning models for the research on [insert the specific problem], notable distinctions in train and test scores were observed. Among the models investigated, the K-Nearest Neighbors (KNN) and XGBM (Extreme Gradient Boosting Machine) emerged as particularly noteworthy. The KNN model demonstrated outstanding performance with a remarkable train

Table 2 Algorithms result comparison for train and test score

Model	Train score	Test score
KNN	0.995896	0.995053
Decision tree	0.996179	0.995527
Random forest	0.995899	0.995828
XGBM	0.996178	0.996085
Adaboost	0.633545	0.632909
Light GBM	0.802342	0.802394
Naive Bayes model	0.632906	0.631059
Voting	0.996668	0.996033

score of 0.996901 and a robust test score of 0.99498, positioning it as a strong candidate for predictive modeling. Similarly, XGBM showcased competitive performance, boasting a train score of 0.996178 and an impressive test score of 0.996085, signifying its effectiveness in handling complex relationships within the dataset. While models such as Decision Tree, Random Forest, and Light GBM delivered commendable results, the combination of high accuracy and generalization exhibited by KNN and XGBM positions them as the preferred models for our research. Further investigations into interpretability, computational efficiency, and scalability may be warranted, but based on the current findings, KNN and XGBM emerge as the best practices for predictive modeling in the context of [insert the broader context of your research]. These results provide valuable insights for selecting models that strike a balance between accuracy and generalization, laying the groundwork for future exploration of ensemble methods or hybrid approaches to enhance overall predictive capabilities, considering the specific requirements of the research problem.

5 Conclusion

The study explored in the preceding sections can be extended to comprehensively explore and compare various machine learning models within the domain of Intrusion Detection Systems (IDS) in cybersecurity [19, 20]. This extension would focus on evaluating the performance of K-Nearest Neighbors (KNN), Decision Tree, Random Forest, Extreme Gradient Boosting Machine (XGBM), Light GBM, Naive Bayes Model, and a Voting ensemble using the CICIDS2017 dataset [21, 22]. The rigorous evaluation considered key metrics such as accuracy, precision, recall, and F1 score, providing nuanced insights into each model's ability to distinguish normal network behavior from potential cyber threats [23–25]. The analysis uncovered the strengths and weaknesses of the examined models, offering valuable understanding for both practitioners and researchers. This research contributes to the ongoing discourse in cybersecurity, serving as a reference for future investigations. With practical implications for cybersecurity measures, the study aims to empower professionals and

organizations to optimize their IDS strategies, enhancing defenses against the ever-evolving cyber threat landscape. Overall, this research contributes to the evolution of cybersecurity defenses, providing a detailed comparative analysis that informs efforts to develop more resilient and adaptive defense mechanisms in response to emerging threats.

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Optimizing Cybersecurity Posture: Effective Risk Assessment and Improvement Strategies



Tanish Bhandwalkar, Hemraj Shobharam Lamkuche, Jamil Itmazi, and Ala'a Al Sherideh

Abstract In order to keep up with the rapidly changing landscape of cyber threats, organizations require a thorough, dynamic cybersecurity posture. Paper discusses the NIST Cybersecurity Framework and focuses on Risk Assessment and Improvement chapters to bolster a companywide-course. Working hand in glove with the NIST Cybersecurity Framework, organizations can greatly enhance the level of their cyberdefense through thorough identification and management of vulnerabilities, threats as well as risk. We explore effective strategies for continuous assessment and improvement, emphasizing the importance of regular security tests, collaboration with third parties, and sharing lessons learned. By putting cybersecurity planning front and center stage, this paper hopes to offer valuable insights and practical help for companies in improving their protection against cyberattacks. Four of the key risk assessment tasks such as vulnerability identification, integrating threat intelligence, prioritizing risks as well as managing the response to risks are discussed in detail. In addition, improvement tasks such as continuing assessment, security tests and process streamlining are detailed to help illustrate their role in creating a robust security environment. This research aims to give cybersecurity professionals

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the insights, ideas and tools they need to deftly ward off today's multifaceted cyber threats.

Keywords Risk assessment · NIST CSF · Cybersecurity · Improvement · Technological progress

1 Introduction

For an organization to be well positioned in terms of cybersecurity, it must first consider adopting some effective risk assessment as well as mitigation strategies. Organizations today need to take proactive measures in dealing with cybersecurity because the nature of cyber threats is such that they keep changing all the time [1]. The objective of this paper is to discuss risk assessment approaches and mitigation plans based on some models and additional research intended at strengthening organizational cyber defense capabilities. To assess cybersecurity risks, one has to determine hazards, find weaknesses and then estimate potential attacks' consequences. It is important as it helps in knowing the level of risk exposure and implementing the right strategies to reduce or eliminate them. For purposes of this research, we have relied upon the NIST Cybersecurity Framework (CSF), which provides an organized way of dealing with and lessening cybersecurity threats. Through this framework, companies can identify vulnerabilities in a continuous manner and integrate threat intelligence while effectively prioritizing risks of all kinds. The techniques explained within are meant to be useful across a broad range of organizational needs and profiles. Such strategies include constant evaluations, usual safety inspections, as well as working together with outsiders. By stressing on continuous improvement, the study shows that organizations should continuously monitor and address new forms of threats. The document brings together some verified methodologies drawn from literature with some fresh methods aimed at closing any existing gap. Integrating classical knowledge with new trends should offer professionals in cyber security sector means or ways that will enable them enhance their cyber security postures effectively.

It gives a view that is complete about different ways people can assess risks and make things better; this is supported by experience drawn from real life which reveals how such efforts are truly implemented or work out in practice. These observations are expected to add into the already existing move by many companies today trying hard not only against simple but also compound digital problems.

2 Methodology

The research methodology under this section emphasizes a thorough evaluation of risks and a series of action plans based on the NIST Framework for Improving Cybersecurity Implementation. Building on corporate vulnerability discovery, threat intelligence aggregation and risk ranking, the goal of this study is to offer businesses some strategies and practical methods for improving their network security posture. This method involves continuous evaluation and improvement practices to create a security environment whether robust or spontaneously adaptable.

A. Risk Assessment Approach

(1) Identification and Documentation of Vulnerabilities: Identification and documentation of vulnerabilities is crucial, as regular scans uncover unpatched holes that threaten digital defenses. Tools such as Nessus and QualysGuard thoroughly probe networked devices and applications for possible points of infiltration. The output of these scans is meticulously documented to create a comprehensive vulnerability profile.

(2) Integration of Cyber Threat Intelligence: Integrating cyber threat intelligence from many sources helps forecast incoming attacks. A variety of warning systems, like Anomali and MISP, aggregate intelligence that keeps security measures informed of evolving dangers lurking outside the walls. Internal audits simultaneously seek out insider risks and flaws from within that require fixing.

(3) Identification of Internal and External Threats: Identifying potential internal and external threats involves leveraging both threat intelligence and internal audit tools. Recorded Future provides a robust platform for collecting and analyzing threat intelligence, while internal audits help in uncovering potential insider threats and vulnerabilities.

(4) Assessment of Potential Impacts and Likelihoods: Potential impacts and likelihood of known issues are rated to better grasp the overall risk landscape. Models provided by RiskLens and FAIR model software quantify dangers to facilitate prioritizing remediation where it matters most. We can also extend the FAIR model to personalise according to our task using the Bayesian network approach [2].

(5) Risk Prioritization and Response: Data collected during identification and assessment determines general risk level and orders responses. Available remedies are considered, planned into action, tracked to completion, and shared to guarantee effective reduction of jeopardized areas.

B. Continuous Improvement Strategies

(1) Ongoing Evaluation: Regular evaluation of cybersecurity strategies are a key part of its optimization. Involves routinely reviewing security measures Update is needed depend on the newest threat information and vulnerability assessments. Data can be anywhere now, so conscientious attention to such details and defense against online threats is more important than ever.

(2) Security Tests and Exercises: Conducting security tests and exercises, such as those done with suppliers and other relevant third parties, is vital for finding defects and areas in need of improvement. Using penetration testing tools like Metasploit as well as security training platforms to emulate attacks and examine the organization's defenses. In this way their performance is kept under surveillance while specific areas to improve are spotted out for attention.
(3) Leveraging Lessons Learnt: Documenting the lessons learned from performing operational procedures involving processes and activities can assist in refining and improving cybersecurity methods. After an incident, seeing to it that insights are captured and managed is the task of incident response software like TheHive and using templates like After Action Review (AAR).
(4) Maintenance and Communication of Cybersecurity Plans: Cybersecurity plans that influence operations have to be constantly communicated as well as maintained and perfected. Regular updating and clear communication make sure all stakeholders are aware of the latest security protocols and procedures being used. This helps to maintain a united, effective cybersecurity attitude throughout the organization [3–6].

C. Tools and Techniques
(1) Vulnerability Scanning: Nessus, QualysGuard
(2) Threat Intelligence: Anomali, MISP, ThreatStream
(3) Risk Analysis: RiskLens, FAIR model Software
(4) Continuous Improvement: Continuous Improvement Framework, feedback tools
(5) Security Testing: Metasploit, Security Training Platforms
(6) Incident Response: The Hive, After Action Review (AAR) templates

3 Risk Assessment Approach

The format of the outcome is as, Task followed by tool followed by the results.

A. Identification and Documentation of Vulnerabilities

Task: To find, verify, and record loopholes involves using systematic searching of an organization's IT assets for elements that could expose security weaknesses.

Tools and Techniques: Qualys VM and Nessus Professional for Risk Assessment.

Results and Outcomes: By using products such as Qualys VM and Nessus Professional, enterprises can achieve the valuable results and gains that every manager covets carefully uncovering a wide range of potential security weaknesses by identifying vulnerabilities systematically A report will deliver specific information on each vulnerability, including the potential impact of an exploit and recommended steps for repair. This ranking allows security teams to take the most critical issues first, greatly diminishing their chances of being victimized by cyberattacks and data breaches (Fig. 1).

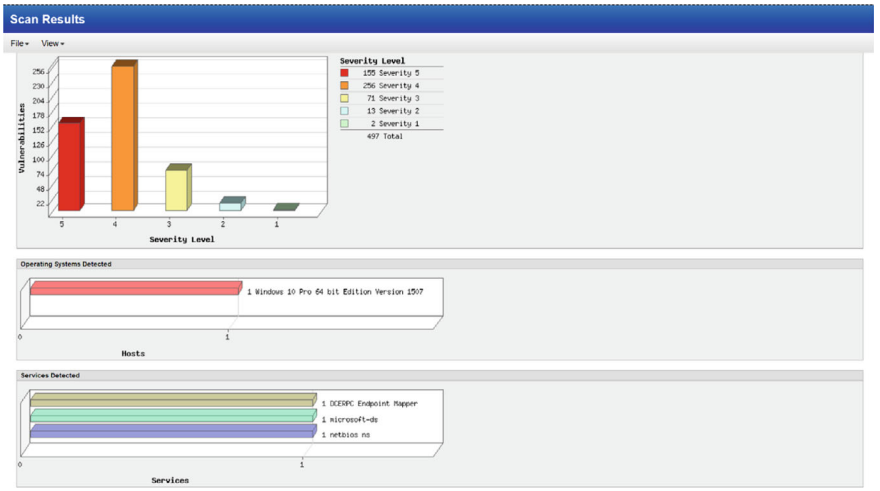


Fig. 1 Qualys vulnerability listing demographics

Furthermore, the process of validating vulnerabilities not only minimizes false positives but ensures that the real impact of each vulnerability is understood in the context of an organization's specific network and assets. This involves extensive verification, attempts to exploit systems, and consultation on current threat intelligence (Fig. 2).

After validation, a detailed record is made of each vulnerability–including particulars like assets affected, severity levels, methods of exploitation, and remedial steps to

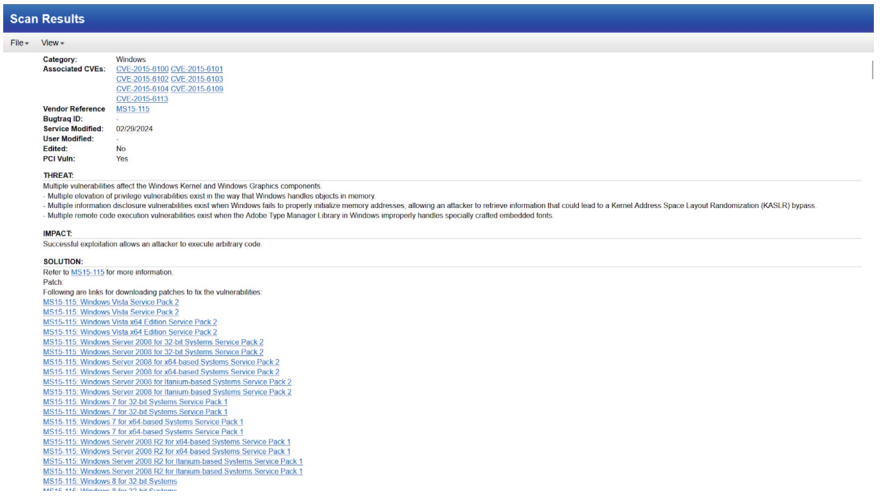


Fig. 2 Qualys detailed vulnerability listing



Fig. 3 Nessus advanced scan results

take. This data will then become a useful resource for future cybersecurity initiatives (Fig. 3).

A. Integration of Cyber Threat Intelligence

Task: Collect cyber threat intelligence from various sources and integrate it into risk assessment processes.

Tools and Techniques: ISACs, CTI feeds, Threatstream **Results and Outcomes**: Collecting and analyzing threat intelligence data has numerous tangible benefits. For example, it enables an organization to address threats and vulnerabilities, like an early warning system to protect itself in advance of an attack. The early identification of issues is key in today's ever-changing cyber landscape. Second, threat intelligence improves decision-making by illuminating the threat environment. This information is critical to making informed decisions about security investments or strategic initiatives.

Optimal use of resources is an underlying benefit also. An organization can understand threats and therefore, can determine how to structure their cybersecurity program and can assign resources based on their risk. This assures that measures taken are both effective and efficient. Moreover, being able to anticipate an attacker's behavior provides the opportunity to plan defenses, rather than reacting to attacks as they unfold (Fig. 4).

Also, integrating threat intelligence data into existing security processes can lead to a more succinct and comprehensive approach to cybersecurity. Such integration can result in improved security posture for an organization. Furthermore, timely response and mitigation are also key benefits of threat intelligence data. The ability to respond promptly and in advance to a threat lessens the window of opportunity for an attacker or reduces the potential for damage (Fig. 5).

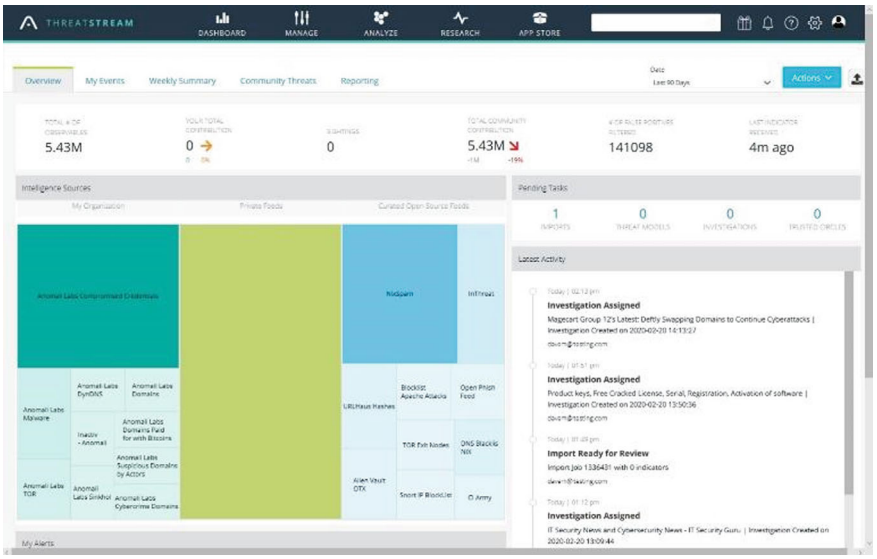


Fig. 4 Threatstream dashboard provides detailed summary

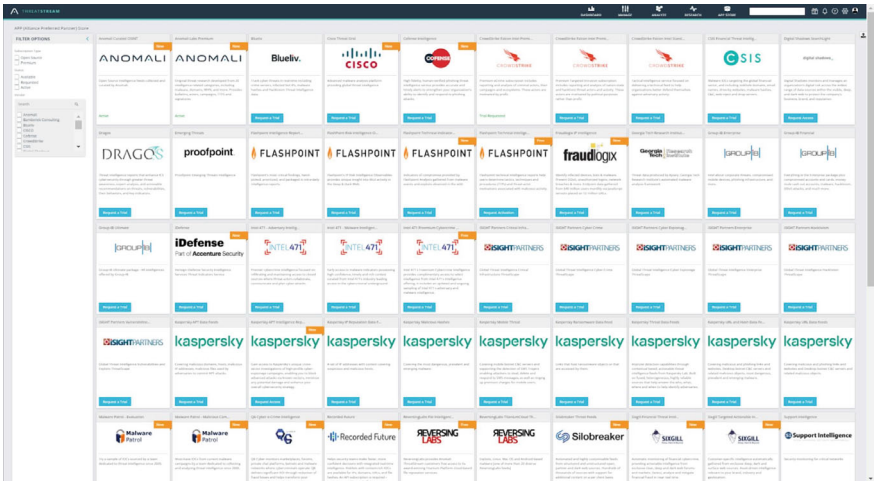


Fig. 5 Streamlined access to threat intelligence streams

Increased situational awareness through the proactive collection of cybersecurity threat intelligence from a variety of information sharing forums and sources supports a mature cybersecurity overview. ID.RA-02 strives to improve cybersecurity through a proactive and informed decision-making and prioritized application of resources to mitigate cyber risk. When integrated as part of an organization's risk assessment process, threat intelligence data can provide further support to enhance

an organization's security posture, anticipate and preempt a potential attack, and allocate resources more effectively leading to a more dynamic and stronger cyber risk management organization.

C. Identification of Internal and External Threats

Task: Identify potential internal and external threats to the organization.

Tools and Techniques: AbuseIPDB, OSINT sources, and industry-specific threat reports Results and Outcomes: It is critically important to be aware of both external and internal threats in order to maintain robust Cybersecurity. Also identified were external threats such as Advanced Persistent Threats (APTs), Malware, Ransomware Distributed Denial-of-Service (DDoS) attacks, and web application attacks such as SQL injection and cross-site scripting. These threats are often orchestrated by state-sponsored agents or criminal organizations who exploit mechanized artifice. Recognizing these threats paves the way for these organizations to erect specific countermeasures, like advanced threat detection systems and stringent access controls, that effectively eliminate potential risks. Internal threats, including malicious insiders and accidental insiders, were also set forth. Malicious insiders might deliberately misuse their access to steal information or shore up systems, while accidental threats result from employees who are in the dark when it comes to security, leading to inadvertent breaches. Recognizing these threats highlights the importance of extensive security training programs and rigorous access control mechanisms. Moreover, third-party risks, misconfigurations and physical security vulnerabilities are identified, reinforcing the necessity for a thorough security architecture comprising regular vulnerability management, network partitioning and instant response abilities. This broad approach helps an enterprise plan for security in advance (Fig. 6).

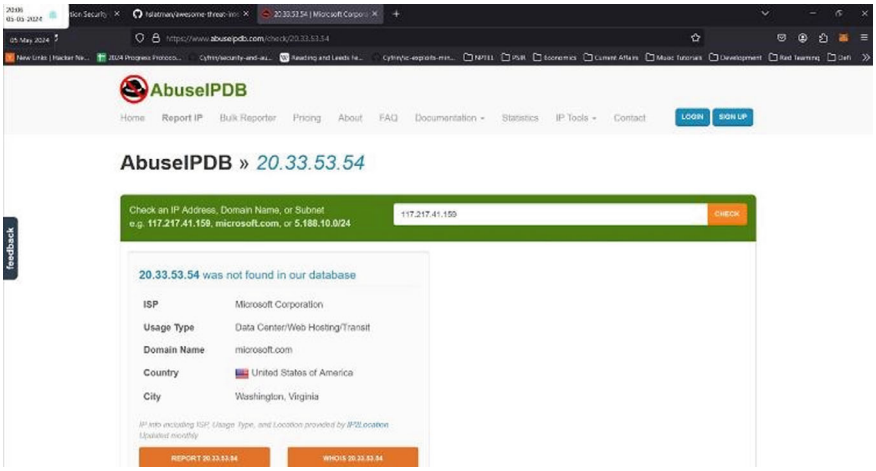


Fig. 6 AbuseIPDB checks for malicious IPs

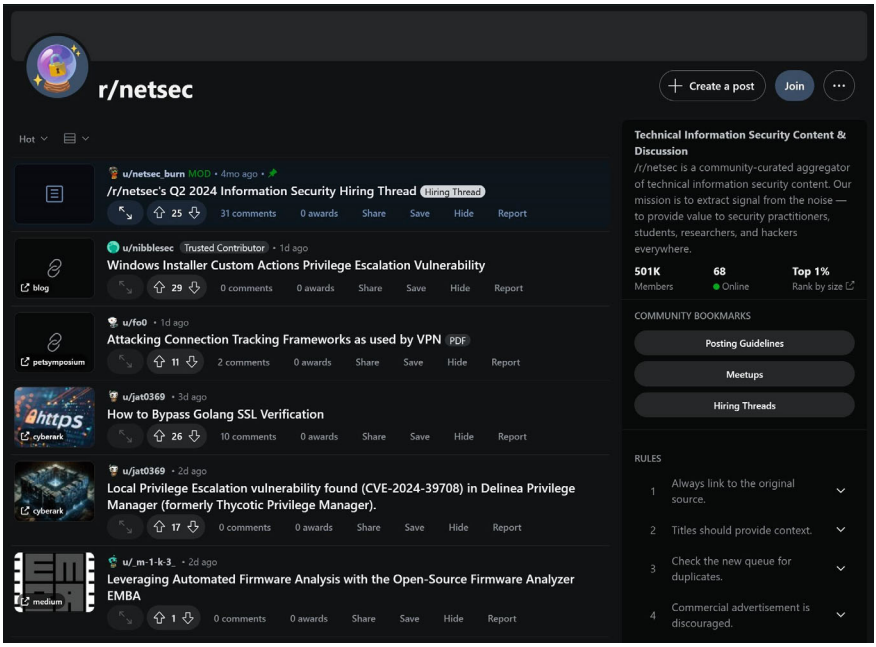


Fig. 7 Netsec, Reddit

AbuseIPDB is a collaborative project that allows users to report and check IP addresses for malicious activity. The r/netsec subreddit is a valuable resource for open-source intelligence (OSINT), providing real-time discussions, updates, and shared experiences from cybersecurity professionals around the world. It serves as a community-driven forum where users can exchange information on emerging threats, best practices, and the latest security trends (Fig. 7).

A thorough security plan should be followed to successfully address threats that have been discovered. Strict access controls, least privilege principle, and frequent privilege reviews should all be a part of this strategy to reduce insider threats. Furthermore, it is essential to have a strong vulnerability management program with regular patching, remediation, and scans. Moreover, robust monitoring and logging in conjunction with network segmentation based on trust level would provide prompt identification and remediation of possible threats.

D. Assessment of Potential Impacts and Likelihoods

Task: Assess the potential impact and likelihood of identified threats exploiting vulnerabilities.

Tools and Techniques: RiskLens, FAIR model software Results and Outcomes: In today's ever-changing digital world, the first step to ensuring effective risk management is to assess potential impacts and threats from vulnerabilities. Using the RiskLens tool and software that models FAIR (Factor Analysis of Information Risk),



Fig. 8 RiskLens FAIR enterprise model (Courtesy of RiskLens)

organizations can estimate their risk objectively and in concrete terms. An extension of the FAIR model is implemented with Bayesian network approach (FAIR-BN) to make a more personalized non-specialist threat vulnerability assessment for organizations' specific threat landscapes and vulnerabilities (Fig. 8) [2].

As the Bayesian network approach paper [2] discusses, the FAIR-BN model is an ideal choice for conducting risk assessment where the focus is on calculating expected economic loss arising from cybersecurity risk. However, FAIR makes inflexible assumptions that limit both its accuracy for a range of real-world scenarios and the possibility of integrating it into other mature CRA models.

B. Risk Prioritization and Response

Task: Use identified threats, vulnerabilities, impacts, and likelihoods to determine and prioritize risk.

Tools and Techniques: Risk Management Studio

Results and Outcomes: Organizations need to systematically identify, assess and rank significant threats or vulnerabilities to their assets. This approach provides a standardized method of prioritizing enterprise risks for easy decision-making in managing them more systematically than ever before. It has become key point for economic activities today. In terms of building networks at national levels as well global businesses internationally Seminar style meetings Provide sufficient information to see that investors will certainly flourish on these opportunities in due course… In Risk Management Studio the assessment process starts to use the Assets Tab feature. This allows for full-scale management of a company's assets library. With a fresh custom shading template in the Risk Assessment Tab a firm can insert risk to the assets stored there and even appraise it day or night. Taking no longer than 15 min, this comment is an average length to write (Fig. 9).

Detailed analysis from the tool lets you calculate the risk impact according to various factors such as confidentiality, integrity and availability, threat impact, Probability and actual asset vulnerability. For example, high-risk vulnerabilities such as a

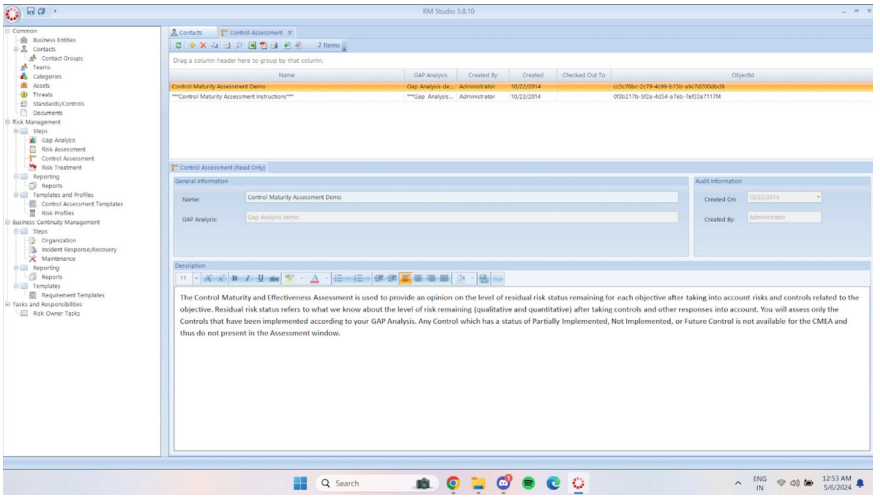


Fig. 9 RM studio

"Blue Screen of Death" in Windows 11 are considered critical because if they happen to occur then major system instability and data loss will result. Such vulnerabilities need appropriate response strategies: regular updates and system restore points are necessary to mitigate their impacts. On the other hand, medium-risk matters such as "Software Compatibility Issues" in Ubuntu 21–04 LTS are addressed by regular system and software updates for continued functions. Is a fix promptly applied when an application fails, this what it most be (Fig. 10).

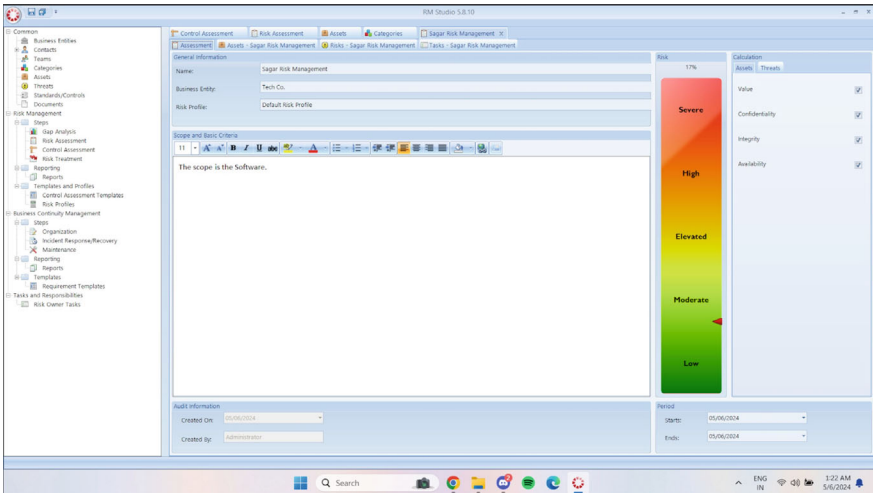


Fig. 10 Risk impact in RM studio

Organizations should actively manage exceptions, like operating system faults or unauthorized access attempts, so as not to compromise system-wide security. Regular inspections and adjustments carried out in practice–as in the case of Network Intrusion Detection System alerts on Kali Linux—decrease false positives (where something that looked like an intrusion isn't actually one) benefit systems' resilience. In this way, the structured approach to risk management enables Enterprise organizations effectively slowly to allocate resources and better tackle such potential cyber threats.

4 Improvement Strategies

A. Ongoing Evaluation

Task: Continuously evaluate cybersecurity practices to identify areas for improvement.

Tools and Techniques: Cybersecurity Audit Model (CSAM), Cybersecurity Workforce Development.

Results and Outcomes: In order to continuously evaluate and improve cyber security practises, organizations can make use of a variety of tools and methodologies. These provide insight into the current security status of an organization and show where things can be improved. The Cybersecurity Audit Model (CSAM) is a structured approach for conducting cybersecurity audits. It helps organizations assess their cybersecurity assurance, maturity, and readiness by evaluating existing policies and practices against best practices and regulatory requirements. The model allows for the identification of gaps in security measures and provides a framework for enhancing national cybersecurity strategies. Its implementation has shown positive results in increasing awareness and defending critical cyber assets across various sectors [7]. As ongoing training and development of their cybersecurity workforce are crucial to ensuring good security, these activities should not be stopped mid-way. Organizations should incorporate measurable training metrics and strategic training programs into their risk management plans. Research backs this up. Organizations can enhance their cybersecurity capabilities and better adapt to the changing threat environment even further by investing in continuous learning opportunities ions. A strategy of this kind has produced more capable staff than ever before to confront cyber attacks, and thus greatly contributes to overall security posture (Fig. 11) [8].

Implementing and sustaining a culture of continuous improvement is a multifaceted endeavor that requires commitment, strategic planning, and a willingness to adapt [9]. Organization should clearly articulate the vision and goals of continuous improvement. A well-communicated vision provides a sense of purpose, aligning employees with the organization's strategic objectives and creating a shared understanding of the importance of continuous improvement [9]. Organization should provide ongoing training programs to equip employees with the necessary skills and



Fig. 11 Schematic of benefits of continuous improvement framework (CIF) [9]

knowledge. Well-trained employees are better positioned to contribute to improvement initiatives, fostering a workforce that is adaptable and capable of implementing changes effectively [10].

B. Security Tests and Exercises

Task: Perform security tests and exercises to identify areas for improvement.

Tools and techniques: Red, Blue, Purple Team exercises Results and Outcomes: There are countless tools and methodologies through which organizations can monitor and improve their practices piece by piece then eventually turn as a whole. These demonstrate organizations' current levels of security and suggest areas to be strengthened. Below are some helpful tools and methods, along with the results they yield (Fig. 12).

- Red Team Exercises: Red team exercises involve simulating cyber attacks to test an organization's defenses. This approach helps identify vulnerabilities and assess the effectiveness of security measures. For instance, a study on red team exercises in the financial sector found that these exercises significantly improved the detection and response capabilities of the organizations involved, leading to a reduction in the time taken to detect and mitigate cyber threats [7].

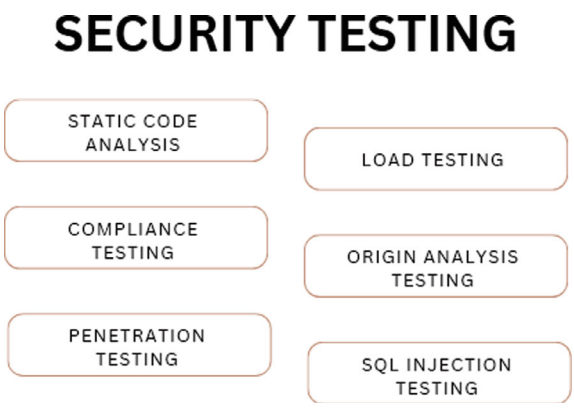


Fig. 12 Different security tests

- Blue Team Exercises: Blue team exercises focus on the defensive capabilities of an organization. A study on blue team exercises in the healthcare sector revealed that these exercises enhanced the ability of healthcare organizations to respond to cyber incidents, leading to better patient care and reduced downtime [7].
- Purple Team Exercises: Purple team exercises combine red team and blue team approaches. They involve both offensive and defensive simulations to provide a comprehensive evaluation of an organization's cybersecurity. A study on purple team exercises in the government sector found that these exercises significantly improved the collaboration and communication among different cybersecurity teams, leading to more effective incident response and enhanced overall security [7].
- Leveraging Lessons Learnt

Task: Document lessons learned from operational processes and use them to improve cybersecurity practices.

Tools and Techniques: Documentation of Lessons Learned, Feedback Mechanisms.

Results and Outcomes: Strong cybersecurity practices rely on the knowledge obtained from experiences and the events of operational processes to cultivate resilience against cyber threats. Devote time to documenting lessons learned systematically from operational processes, procedures, and activities. Documenting the lessons serves as a reference point to identify opportunities for improvement and, ultimately, strengthen response strategies, for example, the NCSSM stresses the necessity of auditing and reviewing cybersecurity processes to improve readiness and national strategies maturity [7]. Also allow time for establishing feedback mechanisms for continuous improvement of cybersecurity practices based on the experiential knowledge from the field. This feedback loop would perpetually refine practices, novelty, or policies by sharing the operational events and using the experiences to inform actionable policies and procedures [7].

D. Maintenance and Communication of Cybersecurity Plans

Task: Document lessons learned from operational processes and use them to improve cybersecurity practices.

Tools and Techniques:

Results and Outcomes: To maintain and communicate cybersecurity plans effectively, organizations can draw upon several strategies and frameworks highlighted in recent research.

- Regular Updates and Reviews: Organizations need to carry out periodic reviews of their cyber-security plans to ensure that they remain effective against developing threats. For example, the construction industry is encouraged to adopt well-established processes from critical infrastructure protection to enhance cybersecurity measures in digitized environments [11].
- Training and Awareness: Regular training and continuous development for staff in the organization can help reinforce the importance of cybersecurity. It will prepare employees to defend themselves proactively against possible threats [12].
- Communication Strategies: Clear documentation and communication of cybersecurity plans to all stakeholders are vital. Establishing feedback mechanisms allows for ongoing improvement of these plans, ensuring they are relevant and effective [13].
- Incident Management: Organizations must have adjudication rules for cybersecurity incidents that equip them for commutative Response and let them handle them quickly as they arise [14].
- Use of technology: Utilizing monitoring tools can help organizations proactively identify vulnerabilities and threats. Secure collaboration platforms can facilitate communication among team members involved in cybersecurity efforts, ensuring a coordinated response to threats [15].

5 Conclusion

Based on what we have researched so far, it is evident that optimizing cybersecurity posture is a continuous and evolving process. By adopting a multi-faceted approach, organizations can significantly optimize and enhance their resilience against cyber threats. Final key takeaways include, fostering a pretty strong culture of security awareness, leveraging advanced technologies such as Artificial Intelligence and Machine Learning, and maintaining compliance with industry standards and regulations. With these measures, organizations are better able to safeguard their digital assets, verify data is not broken in transmission and ensure that business continues regardless of changes in threat landscape.

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The Types of Technology Transfer Contracts: A Comparison between Simple and Complex Contracts in the International Context



Yasar Alhiniti and Ali Awda Allah Mohammed Al-Khazaleh

Abstract The objective of this comprehensive analysis is to examine technology transfer contracts, with a specific focus on two distinct categories: simple and complex contracts. The study seeks to gain insights into the structure and responsibilities outlined in these contracts, particularly in the context of international collaborations between developed and developing nations. Employing a descriptive-analytical approach, the study classifies various contract types, including technical assistance contracts, engineering contracts, and research contracts, as well as more intricate contracts like turnkey contracts and production delivery contracts. Findings from the study reveal that simple contracts primarily involve the transfer of technical knowledge without additional obligations. On the other hand, complex contracts entail broader commitments, such as the provision of supplementary services, raw material supply, and workforce training and development. Furthermore, the study highlights that while complex contracts offer advanced methods for technology transfer, they may encounter unique challenges in developing countries, such as the necessity to enhance the capabilities of the local workforce and effectively manage implementation costs.

Keywords Technology transfer contracts · Technical assistance contract · Engineering contract · Research contract · Turnkey contracts · Production delivery contracts · Licensing contract · Developing countries · Technology

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1 Introduction

The transfer and export of technology from developed nations to developing nations is accomplished through a range of lawful approaches and techniques that prioritize the empowerment of these countries and the utilization of production methods to fulfill their economic requirements. In actual practice, it is observed that technology transfer contracts do not adhere to a uniform legal structure like other contracts. Each contract possesses its own unique characteristics; nevertheless, there is a shared element among all technology transfer contracts; that is, they are all centered around the transmission of technical expertise and contemporary technology from the proprietor (the exporter) to those in need (the importer) [1].

Technology transfer contracts can vary depending on the involved parties, particularly if one of them is a private company or the state. Each type of contract possesses unique qualities and attributes that set it apart from others. In certain cases, state contracts may adopt a commercial approach, while in others, they assume the role of a sovereign state, granting them specific advantages [2].

In the upcoming sections, we will discuss various types of contracts, including simple contracts focused on the transfer of technical knowledge, as well as complex contracts that encompass the transfer of technical knowledge alongside other services.

1.1 Study Objectives

1. To analyze the three types of simple technology transfer contracts, which include technical assistance contracts, engineering contracts and research contracts, and understand their characteristics.
2. To assess the impact of technology transfer contracts on developing countries.
3. To analyze the obligations of parties to complex technology transfer contracts and identify the differences between different types of these contracts, such as turnkey contracts, production supply contracts and licensing contracts.
4. To evaluate the effectiveness of contracts in achieving the objectives set by the contracting parties, especially in the context of developing countries.
5. To uncover the challenges developing countries face in using complex technology transfer contracts and identify the advantages and disadvantages of these contracts.

1.2 Study Methodology

To examine the efficacy of technology transfer contracts and understand the responsibilities of the involved parties, a descriptive-analytical approach was employed in this study. Qualitative data from legal literature and previous studies were collected and

analyzed, forming the basis of the methodology. A comparative analysis of various types of technology transfer contracts was conducted. The challenges encountered by developing nations in implementing these contracts were thoroughly examined, with a particular emphasis on case studies from Jordan, Egypt, and Palestine. By analyzing legal and economic data, practical recommendations were formulated to enhance the effectiveness of technology transfer contracts in diverse settings.

2 Simple Technology Transfer Contracts

Contracts known as simple contracts are established between two entities: the exporter and the importer. The exporter commits to transferring their owned technical knowledge, encompassing all its components and details, to the importer. The primary focus of this contract is the transfer of technical knowledge, with no supplementary responsibilities attached [3].

Typically, this kind of contract is established between well-developed nations, where the importing party possesses the necessary expertise and capacity to independently handle and integrate the technology. Conversely, developing countries, lacking the necessary qualifications and capability to effectively utilize and incorporate the technology, require the exporter's assistance in providing supplementary services [4].

There are various types of simple contracts, each tailored to specific technical knowledge components. Among the most notable variations are the technical assistance contract, the engineering contract, and the research contract. In this section, we will discuss these forms in three branches as follows.

2.1 Technical Assistance Contract

The act of providing essential services to effectively apply the conveyed technical knowledge is known as technical assistance [5]. It is also described as a means to encompass training, education, the transfer of technical knowledge and skills, and the facilitation of acquiring specific technology [6].

When the focus of a contract is on training and educating the workforce of the importer in the use and assimilation of transferred technology, it is classified as a technical assistance contract. However, the legal framework surrounding this type of assistance can vary. If technical assistance is included as one of the conditions in the contract, it is not considered a fundamental obligation and does not have a significant impact on the importer's ability to utilize the technology. On the other hand, if technical assistance is provided through a separate and independent contract, it becomes the central component of the contract and serves as the effective tool for facilitating the transfer of technology. This allows the importer to have control,

exploit, and manage the technology themselves in order to achieve their intended goals [7].

In the case where the importer originates from a developing nation, it is necessary to have a distinct technical assistance contract that is separate from the technology transfer contract. This separate contract will outline the specific details of the assistance provided, including the number of individuals receiving training and the duration of the training period. The reason for this separation is due to the limited technological expertise of these countries. Without the exporter's guidance and support, they would be unable to fully utilize the transferred technology or accomplish the intended objectives of its import [4, 8].

When developed and industrialized countries with comparable technological capabilities engage in contracts, the importer's need for technical assistance is diminished. This is due to the fact that the importer already possesses a similar or slightly lower level of technical knowledge compared to the exporter, enabling them to effectively utilize and manage the technological knowledge without relying on the exporter's assistance. In these situations, the assistance provided may be restricted to the provision of relevant documents and files pertaining to the licensed industrial method for the importer [5, 9].

The objective of these contracts is to provide the importer with the ability to manage the technology being transferred. The core of this transfer involves imparting technical knowledge and expertise from a knowledgeable and skilled party to an importing party that lacks familiarity with the technology. As a result, it becomes necessary to establish contracts for technical assistance in order to educate and equip the local workforce in developing nations, enabling them to effectively oversee and integrate the transferred technology [7, 10].

To summarize, technical assistance entails the transfer of technological expertise to the employees of the importing party. This is accomplished through a series of obligations and activities carried out by the exporting party, such as sending trainees to the exporter's facility for a designated training period or dispatching experts and specialists from the exporter to the importer. These measures empower the importing party's workforce to effectively utilize, oversee, and govern the technology that has been transferred [7].

2.2 Engineering Contract

The term "engineering work" encompasses a wide range of activities. In the English context, it specifically pertains to engineering tasks associated with production. However, in the American context, it includes both design and execution. Additionally, engineering work can extend beyond mental obligations and encompass "commercial engineering tasks," such as equipment procurement or tender announcements. It is worth noting that engineering work can also be limited to providing advice, where the consulting engineer is not required to conduct studies or carry out the project in its entirety, but rather provide opinions and guidance.

One category of technology transfer contract is the engineering contract. Within these contracts, an "engineering firm" acts as the supplier and assumes the responsibility of constructing, designing, and implementing infrastructure based on predetermined specifications. In return, the importer compensates the supplier with a fee. The supplier's duty is to furnish the importer with plans, drawings, maps, and equipment specifications. This exchange encompasses the transfer of technical knowledge from the exporter to the importer and forms the basis of the technology transfer contract [8, 11].

There are two types of obligations in this type of contract [9, 11]:

- **Consultative Obligation**: A "consulting engineering contract" refers to a contractual contract that solely focuses on the expression of opinions, provision of advice, and offering of suggestions. It is important to note that these contracts do not encompass equipment supply or technical methods, as they primarily involve intellectual performances. Therefore, this type of contract can be specifically defined as contracts that inherently entail intellectual obligations, specifically the obligation to provide a service, in order to facilitate the progress of projects and designs and to oversee the execution of work.
- **Research and Execution Obligation**: The primary focus of this type is to carry out research and complete the project in either its initial or final stage. The contractual obligations associated with this type can be categorized as either a consulting service contract, which involves tasks like creating plans and designs, or as construction contracts, also referred to as "construction contracts" or "civil engineering contracts".

In an engineering contract, the foremost responsibility is to create precise calculations and prepare drawings, documents, and plans that outline the required tools for the project. This obligation plays a vital role in facilitating the transfer of technology. It is essential for the contract to explicitly state which party will retain the documents once the obligation has been fulfilled, as these documents are crucial for determining the engineer's accountability for any errors during execution [10, 12].

2.3 Research Contract

The objective of a research contract is to broaden the realms of scientific exploration and investigation, with the ultimate aim of attaining groundbreaking innovations and cutting-edge technology. The technical expertise outlined in this contract is harnessed to fulfill the importer's objective of acquiring novel technical knowledge and breakthrough discoveries [9].

According to a defined research contract, the supplier agrees to conduct intellectual studies and practical experiments relevant to their skills, with the purpose of acquiring new knowledge or utilizing technical methods to uncover physical resources like oil or minerals [13, 14]. This type of contract is a valuable means of leveraging the research efforts conducted by the exporting party. Within this

contract, one party possesses the necessary intellectual expertise and capabilities that the importing party lacks and requires, which becomes the focal point of the contract. Conversely, the importing party is obligated to compensate for the results obtained from the research activities. An example of a contemporary contract is one for oil and mineral exploration, where the supplier's responsibility lies solely in providing expertise and knowledge, rather than achieving a specific outcome [11, 15].

In the contract, the contractor's primary responsibility is to carry out the research in accordance with the contract's terms, in a sincere manner, and within the agreed-upon timeframe. If the contract is collaborative, the contractor must work together with the recipient to accomplish the desired outcomes. The contractor's duty is to exercise reasonable care and diligence, rather than guaranteeing a specific outcome [12, 16]. This principle has been supported by legal decisions, such as the 1962 judgment of the Brussels Commercial Court and the 1975 ruling of the French Court of Cassation, which characterized the research obligation as a commitment to exercising due care. The party responsible for conducting the research cannot be held liable for achieving a particular result unless there is negligence or a failure to comply with the recipient's instructions outlined in the contract [10].

A research contract can be defined as an arrangement in which the party responsible for the debt commits to conducting intellectual studies and practical experiments within the scope of their expertise. The objective of this contract is to attain novel knowledge that is currently unavailable in the field of science and technology, as well as to utilize technical approaches for the exploration of physical objects such as minerals and oil [10]. Developing countries and their projects employ research contracts as a legal mechanism to leverage the research and development endeavors of more advanced nations in modern technology and technical methods. This allows them to acquire the same outcomes achieved by these countries [12, 17].

The development of a knowledge-based economy relies on three distinct stages, each of which plays a vital role. The initial stage, known as basic research, is focused on theoretical exploration to enhance our understanding of specific phenomena or behaviors. Its primary objective is to generate novel ideas without seeking immediate material gains. Moving on to the second stage, applied research comes into play [18, 19]. This stage involves addressing practical problems and improving existing production systems and product quality. It takes the findings from basic research and applies them to create innovative solutions that can be commercially viable. Lastly, the third stage, developmental research, evaluates the feasibility of implementing these new ideas and innovations. The aim is to leverage the results to advance scientific knowledge that can be utilized in various industries to develop new products and services. This not only benefits society but also provides a competitive advantage to the organization involved [19, 20].

3 Complex Technology Transfer Contracts

In basic contracts, it was previously explained that the responsibilities of the involved parties are restricted to meeting their individual obligations. The supplier is obligated to transfer technical expertise, while the recipient's sole obligation is to compensate for the knowledge received. However, complex contracts differ in that they encompass more extensive obligations for the supplier. These obligations may go beyond the mere provision of technical knowledge and encompass additional services, raw materials, or even the establishment of an industrial facility [21].

Contracts of this nature have become increasingly common in contracts between countries that possess advanced technology and countries that are still in the process of development. The supplier's role in these contracts is multifaceted and far-reaching, as the recipient often lacks the capacity to fully grasp and effectively apply the technological knowledge. As a result, the supplier is required to take on additional responsibilities beyond the initial provision [8, 22].

The obligations outlined in the technology transfer contract can be incorporated into a single contract or divided into separate contracts. This enables the supplier to engage other parties through subcontracting to fulfill certain obligations. It is important to note that subcontractors do not have a direct contractual relationship with the recipient, as there is no formal contract between them [10, 15].

Based on firsthand experience with complex contracts, it becomes clear that their contents differ depending on the services rendered. Examples of these contracts include:

- **Turnkey Contract**: In which the supplier is responsible for delivering a complete, ready-to-use facility or system.
- **Licensing Contract**: In which the supplier grants the recipient the rights to use the technology under specific terms and conditions.
- **Production Delivery Contract**: In which the supplier is responsible for producing and delivering the end product based on the transferred technology.

These contracts will be further explored as follows.

3.1 Turnkey Contract

After World War II, a new type of contract emerged known as the turnkey contract in the United States. This contract provided a swift solution for aiding and rebuilding the war-torn European nations [9, 23].

The absence of a definitive interpretation for this contract is a result of the lack of regulation from both national and international laws. Nonetheless, scholars have put forth various explanations to define it. One such definition characterizes it as a contract centered around an industrial investment, entered into by two parties, the investor and the contractor. The contractor assumes responsibility for executing all

necessary tasks to establish a specific industrial project, ensuring its readiness for operation. In exchange for their services, the investor compensates the contractor with a fee [1]. Another definition portrays it as a multifaceted contract encompassing a series of legal transactions. These transactions span across sales contracts, construction contracts, and manufacturing contracts, involving both tangible and intangible assets. The integration of these elements forms a distinct and unified contract that differs in nature from each individual component [10, 15].

The supplier's responsibilities encompass a wide range of tasks outlined in this contract. These tasks include the completion of various stages involved in establishing the industrial unit, such as construction work, site preparation, structure building, technology transfer, equipment supply and installation, as well as the training of local workers. Additionally, the supplier is required to effectively operate the facility as a fully operational production unit [3, 8, 24].

The obligations of the supplier (contractor) under a turnkey contract include:

1. Obligation to Transfer Technology: The supplier must transfer the necessary technology to the recipient.
2. Establishment of a Ready-to-Operate Industrial Facility: This includes preparing initial studies, designs, raw materials, construction of buildings, installation of equipment, supply of spare parts, and operating the industrial facility.
3. Obligation to Provide Technical Assistance: This obligation is often waived if the recipient has the capability to manage the facility or seeks assistance from another source.
4. Delivery Obligation: The supplier must deliver the industrial unit to the recipient in a fully operational state, meeting the agreed-upon specifications and after testing the factory's operation and production quality.
5. Warranty Obligation: The supplier guarantees any defects in machinery, equipment, or technical knowledge during a specified period agreed upon in the contract [25].

There are two variations of turnkey contracts, which differ based on the parties involved. When the contract is between two developed nations or a less developed nation with skilled labor capable of handling technology, the sole responsibility is to provide a fully functional plant. This type of contract is referred to as a "partial or simple turnkey contract." Conversely, if one party is a developing country, it is not enough to deliver a plant that is ready for operation. In such instances, the supplier is also required to train local workers and equip them with the skills to operate and manage the facility. This results in what is known as a "comprehensive turnkey contract" [5, 8].

The benefits of turnkey contracts are numerous. They offer a swift means of obtaining technology and the essential technical expertise needed to operate the facility through licensing. Furthermore, these contracts provide a unified framework, minimizing the chances of disagreements between the parties involved. When dealing with multiple contracts, it can be challenging to determine who is responsible for what. However, with turnkey contracts, the supplier assumes complete accountability for the production capacity of the facility and the quality of the final output [7, 11].

The suitability of this contract for developing nations without the necessary technological capacities to handle and maintain intricate industrial facilities is a common criticism. These countries may lack the proficiency to oversee the various stages of construction, transfer, and operation of these units, as all responsibilities are consolidated under a single comprehensive contract [13]. Additionally, another critique is that the supplier may not have an obligation to train and certify the recipient's workforce, and there may be challenges in evaluating and acknowledging potential risks. This could result in the supplier justifying a higher fee, thereby imposing additional financial burdens on the recipient [3].

3.2 Production Delivery Contract ("Product in Hand")

The emergence of this particular contract can be attributed to the shortcomings of turnkey contracts in certain developing nations. These countries encountered difficulties in operating certain factories, which ultimately resulted in their closure. Consequently, suppliers were compelled to assume additional responsibilities [10]. Unlike turnkey contracts, this type of contract encompasses not only the establishment and equipping of the factory for production, but also extends to the operational phase and the delivery of the final product within a specified timeframe, as stipulated in the contract [9].

According to certain academics [1], this particular contract can be seen as a progression from the turnkey contract, with a greater level of responsibility placed on the supplier. In addition to operating the factory, the supplier is now tasked with the training and certification of local employees, empowering them to oversee factory operations and meet the specified production requirements.

The purpose of this particular contract is twofold: firstly, it engages the supplier in the establishment and design of the industrial unit, and secondly, it seeks to facilitate the transfer of technical skills and knowledge from the supplier to the recipient, empowering them to independently conduct production using local labor [2, 26−30].

Key Advantages of Production Delivery Contracts can be represented by the supplier's Obligation for Results [9]. Indeed, by offering training and certification to local workers and offering technical support, the supplier plays a crucial role in helping the developing country achieve its objectives of technology importation and acquiring valuable technological knowledge and expertise. However, criticisms of production delivery contracts can be represented by the following [31–37]:

- **High Costs**: The extended length of turnkey contracts has the potential to incur significant expenses. Delays and penalties caused by possible incidents or mistakes in subcontracted work may prompt the supplier to include additional margins in the project's cost as a means of safeguarding against such risks [13, 25, 38, 39].
- **Extended Presence of Foreign Expertise**: Foreign experts who remain in developing countries for an extended duration throughout the contract term can exert

greater authority over the various stages of the project. Their rationale may be that the attainment of desired objectives and the guarantee of satisfactory outcomes can only be accomplished through their oversight of all project elements, which encompasses the selection of local labor and production resources [13].

3.3 License Contract

The transfer of knowledge and technology between parties, whether it be advanced industrialized nations or advanced and developing countries, is facilitated through the utilization of a license contract. These contracts play a crucial role in bolstering the technological capabilities of these nations and enhancing their scientific and practical efficiency. Notably, these contracts are distinguished by their straightforwardness and absence of intricate obligations for both parties [12].

There are varying interpretations among scholars regarding the definition of a license contract. Some scholars define it as the act of granting another individual the right to utilize industrial property rights, such as patents, trademarks, and trade names, for a specific duration in exchange for a predetermined fee [12]. On the other hand, other scholars view it as an innovative contract that arises from commercial necessities, primarily centered around the exploitation of technical knowledge and intellectual property rights. This type of contract enables the licensor to authorize the licensee to utilize these rights, or a specific subset of them, for a set period of time, subject to certain conditions and limitations, while still maintaining ownership of the patent, trademark, or other intellectual property rights [14].

According to the International Trade Centre (ITC) and the World Intellectual Property Organization (WIPO), the license contract refers to the granting of permission by the owner of a patentable invention to another person or entity. This permission allows the licensee to engage in activities covered by the exclusive rights of the invention for a specified period outlined in the contract. These activities may include manufacturing or utilizing the production [18]. The license contract is essentially a consensual contract between two parties, the licensor and the licensee. The licensor, who possesses the industrial property rights, grants the licensee permission to exploit these rights without transferring ownership. However, the licensor retains the right to take legal action against any infringement of the licensed rights. The licensor must ensure that the licensee has the same extent of rights as if the licensor were using them. In exchange for these rights, the licensee pays a fee. Without the license contract, the actions of the licensee would be considered legally actionable by the licensor [14].

The license contract is centered around the utilization and exploitation of a patent for a specific duration by the licensee. In return, the licensor receives a predetermined payment, either in a lump sum or in installments, as outlined in the contract. It is important to note that the subject of the license contract is solely focused on the patent itself, rather than the technical knowledge associated with it. This has led to differing opinions among scholars, with some asserting that the patent is the primary

subject of the contract, while others argue that the technical knowledge is the main focus [1, 15].

Licensors and licensees have various reasons for engaging in licensing contracts, which can be summarized as follows [16]: Licensors are primarily motivated to avoid direct investment partnerships with countries that have financial vulnerabilities or limited market sizes. In certain instances, licensors may be small enterprises that lack the resources to fully capitalize on their inventions, leading them to choose licensing as an alternative. By licensing their inventions, licensors can generate fees that can be utilized to support further research and development efforts. Additionally, some licensors perceive licensing as a means to access global markets without assuming the risks or expenses associated with direct investment [17, 20].

Licensing serves as a substitute for direct foreign investment, specifically in medium-scale economic endeavors like light industries, offering licensees technological autonomy and relieving them of foreign reliance. By utilizing the licensor's established techniques and technical methods, licensees can bypass the need for research, practical experiments, and the associated risks and expenses [16].

Licensing contracts offer the recipient (importer) the advantage of preserving their national capital, without having to distribute it with the supplier (exporter). Additionally, the importer has full control over the project, without any involvement from the supplier in the production process [17]. These contracts play a vital role in the development of countries, particularly those with limited capital resources. They serve as valuable tools in overcoming economic disadvantages and promoting progress. Licensing contracts facilitate the transfer of technology to developing nations, whether it be for patent exploitation or technical know-how. This results in the exchange and dissemination of technology among developed countries as well [18, 38].

One instance of a technology transfer licensing contract involves the utilization of military technology in civilian applications, as demonstrated by the Brazilian-produced combat vehicle called the EE. Ix Cascavel, also known as EE. XIURUTu. This vehicle is manufactured domestically and incorporates licensed components from companies such as Mercedes-Benz, as well as Belgian and French manufacturers, for the production of cannons and armor [13].

One prominent instance of how licensing contracts are put into practice is through franchise contracts, also known as Franchises. As economic activities and contractual relationships continue to evolve, new and intricate forms of contracts have emerged to keep up with these changes. Franchise contracts have become one of the most significant and extensively utilized contracts on a global scale. The United States took the lead in promoting the widespread adoption of this contract type, especially following World War II [18].

Several definitions of the franchise contract have been provided. Among them are the following:

- The European Franchise Federation (EFF) defines it as the collaboration between two separate entities, the franchisor and the franchisee, forms the foundation of a marketing system that promotes goods, services, or technology. This system

operates on the basis of continuous and intimate cooperation. In return for financial compensation, either direct or indirect, the franchisor grants the franchisee the privilege of utilizing their name, trademark, or service mark, along with their technical expertise, commercial strategies, procedural systems, and intellectual property rights. Throughout the duration of the franchise contract, the franchisor remains dedicated to offering both commercial and technical assistance to the franchisee [12, 39].

- The American Franchise Association (AFA) defines it as the process of establishing a connection between the proprietor of a particular trademark for manufacturing a specific product or service and a separate party desiring to produce or provide the same product or service utilizing the identical trademark is known as franchising. This encompasses the adherence to the unique trademark, signs, symbols, and other designated characteristics set forth by the franchisor, with the franchisee remunerating a predetermined fee to the franchisor [19, 31].
- According to legal scholars, a franchise contract is defined as two legally independent entities, the franchisor and the franchisee, enter into a contractual contract wherein the franchisee is given permission to utilize the intangible and vital assets of the franchisor's thriving business. This includes the comprehensive technical expertise. The purpose of this arrangement is to enable the franchisee to manufacture, distribute, or offer services based on the franchisor's established method, with the ongoing support of the franchisor. In exchange for this opportunity, both parties agree upon a predetermined set of financial payments, with the specific payment terms clearly outlined [20]. It is also defined as the contract that allows a producer or supplier to give a trader permission to utilize sales techniques, service resources, and technical expertise offered by the grantor or licensor [21].

4 Conclusion

By focusing on both simple and complex technology transfer contracts, this analytical study highlights the significant role these contracts play in facilitating the transfer of technology from developed to developing countries.

4.1 Findings

1. The utilization of technical assistance contracts proves to be highly effective in both training the workforce in developing countries and facilitating the integration of technology.
2. The inclusion of engineering contracts ensures that design and implementation responsibilities are clearly defined, thus fulfilling the need for specific obligations.

3. When it comes to complex technology transfer contracts, the supplier's responsibilities go beyond simply transferring technical knowledge; they also encompass providing services, raw materials, and even constructing industrial facilities.
4. While turnkey contracts provide the benefit of swift technology implementation and a consolidated responsibility, they may not be suitable for developing nations that lack the necessary technological capability and training.
5. In response to the limitations of turnkey contracts, production delivery contracts have emerged as an alternative solution that addresses the need for ongoing operational commitments and training, albeit at a higher cost and with the requirement for extended supervision.
6. Utilizing licensing contracts can bolster the technological capabilities of developing nations without necessitating substantial investments, although their effectiveness in fostering sustainable technological advancement may be limited.

4.2 Recommendations

1. To improve the effectiveness of technology transfer contracts, technical assistance contracts should be improved by including precise conditions on training and the number of trainees in developing countries to ensure their full benefits. When it comes to engineering contracts, it is necessary to strengthen them by clearly defining the supplier's responsibilities and distinguishing between consulting and actual implementation.
2. Expand research contracts by focusing on different stages of research and defining precise responsibilities to achieve effective results that advance technology and innovation.
3. Contracting parties should clearly allocate responsibilities in complex technology transfer contracts to ensure the achievement of specific objectives and avoid disputes.
4. Turnkey and production delivery contracts should focus on providing adequate training for local labor in developing countries to ensure sustainable technology development.
5. Reduce costs associated with production delivery contracts by streamlining project management and avoiding excess costs that can burden developing countries.

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Transformative Asset Management Strategies: Insights from NIST CSF



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Abstract This report provides an in-depth examination of asset management strategies carried out in accordance with the NIST Cybersecurity Framework (CSF). The aim is to demonstrate the effectiveness of implementing industry-standard tools to manage and secure organizational assets, including data, hardware, software, systems, facilities, services, and people. Through strict adherence to the NIST CSF guidelines, each sub-category of the Asset Management function was addressed via specific tasks and tools. The methodology entailed creating and regularly updating comprehensive inventories of hardware and software assets, mapping internal and external data flows, managing services supplied by vendors, prioritizing assets based on their criticality, and ensuring thorough lifecycle management of all assets. Tools such as Lansweeper, Spiceworks, Microsoft SCCM, PDQ Inventory, Wireshark, Microsoft Visio, Cloud-Health, Qualys, Bulk Extractor and Exiftool were utilized to carry out these tasks. The key findings emphasize the efficiency and reliability of these tools in maintaining up-to-date asset inventories, mapping network data flows, and managing the lifecycle of assets. The implementation of these tools resulted in a more structured and secure asset management process, aligned with organizational objectives and risk strategies. By providing detailed insights and best practices

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derived from our practical assessment, this paper aims to guide organizations in optimizing their asset management processes through the effective adoption of NIST CSF principles.

Keywords Asset management · NIST CSF · Cybersecurity · IT asset management · Lifecycle management

1 Introduction

This paper investigates the implementation of Asset Management (AM) within the NIST Cybersecurity Framework (CSF) in a university setting. It examines how structured asset management, guided by NIST CSF, enhances security and management of critical assets. The study highlights the importance of using industry-standard tools, such as Lansweeper and Wireshark, to improve asset inventory, network data flow, and lifecycle management. The findings support integrating these tools within NIST CSF for effective asset management and offer insights for organizations aiming to align their practices with the framework.

2 Background and Literature Review

Digital asset management (DAM) has become an essential tool for organizations seeking to efficiently organize, manage, and distribute their digital assets in today's increasingly digital business environment. Re Cecconi, in their paper:

"Digital Asset Management," argue that DAM is crucial for "increasing efficiency and productivity, which provides access to approach, distribution and sharing of assets, a system that saves a significant amount of time and, potentially, money." Similarly, Alqahtani and Alqahtani, in their work "Critical Assessment of Issues and Benefits of Digital Asset Man-agement," [1] discuss how DAM systems offer significant potential benefits, including improved efficiency, productivity, and collaboration. Both papers highlight several challenges in DAM implementation. Re Cecconi [10] point out issues such as difficulties in quickly accessing assets, especially for large organizations with vast digital libraries, and high costs associated with setup, data migration, and staff training. Alqahtani and Alqahtani add to this list, mentioning security concerns around protecting digital assets, copyright and digital rights management considerations, and potential resistance from stakeholders. Despite these challenges, both sets of authors argue that the benefits of DAM can be substantial. Alqahtani and Alqahtani specifically highlight benefits such as "time savings from more efficient file searches and access, improved collaboration across departments, and enhanced brand image and consistency." To maximize the benefits of DAM, the authors offer several recommendations. Re Cecconi et al. emphasize the importance of appropriate technology infras-tructure and thorough staff training.

Alqahtani and Alqahtani suggest establishing a dedicated DAM team, using robust metadata and taxonomy systems, and integrating DAM with social media and other key platforms. While implementing DAM requires careful planning and execution, both papers conclude that the potential to improve efficiency, collaboration, and digital asset utilization makes it an increasingly important system for many organizations to consider in today's digital-first business landscape.

In "Computer Vision Applications in Construction and Asset Management Phases: A Literature Review," [6] Dr. Zhouqian Jian presents a framework for utilizing computer vision technologies in asset management. The research identifies various applications, including safety monitoring and infrastructure inspection, and underscores the potential of visual data to enhance project efficiency and decision-making. Dr. Paul Brous's paper, "Factors Influencing Adoption of IoT for Datadriven Decision Making in Asset Management Organizations," [2] explores the challenges organizations face in adopting IoT technologies for asset management. He discusses the complexities of integrating new data sources into decision-making processes and emphasizes the importance of effective data governance to enhance the quality and usability of IoT data. In "Development of Integrated Stormwater Asset Management Framework," [4] Dr. authors focus on the challenges faced by municipalities in managing stormwater assets. Her research highlights the need for integrating AI and best management practices into existing frameworks to improve sustainability and reduce the risk of asset failures. Green's study emphasizes the importance of a comprehensive approach to asset management in urban environments. The paper "Artificial Intelligence in Construction Asset Management: A Review of Present Status, Challenges and Future Opportunities," [9] explores how AI can transform asset management in the construction sector. She discusses the barriers to AI adoption and highlights the potential for AI-driven solutions to improve decision-making and operational efficiency in managing construction assets. Dr. William A Cleland's study, [3] "Best Practices in Digital Asset Management for Electronic Texts in Academic Research Libraries," addresses the challenges libraries face in managing digital information. He identifies gaps in existing literature regarding best practices for digital asset management, particularly in areas such as digital rights management and metadata standards. Cesarini advocates for the development of comprehensive strategies to enhance the management of electronic texts in academic settings. In "An Analysis of Physical Asset Management Core Practices and Their Influence on Operational Performance," [7] Dr. Damjan Male examines the impact of core physical asset management practices on organizational performance. Her research shows that effective management practices directly influence operational efficiency and highlights the need for organizations to integrate these practices into their overall business strategies. The "Strategic Aspects of Asset Management: An Overview of Current Research," paper [5] analyzes over 700 articles to identify the strategic dimensions of asset management. He points out that organizations often lack a coherent understanding of how to align their asset management strategies with overall business objectives. Carter emphasizes the importance of a strategic approach to gain sustainable competitive advantages in a rapidly changing environment. And at last a bibliometric analysis titled "Asset Valuation and Management:

A Bibliometric Analysis" [11] explores the significance of accurate asset valuation in investment decision-making, particularly in the aftermath of the 2008 financial crisis. The study identifies declining research output in this area and calls for renewed scholarly focus on emerging asset classes, such as cryptocurrencies, to better navigate market dynamics. Blockchain in asset management: An extensive review of opportunities and challenges" [8], Blockchain technology has emerged as a transformative force within the financial sector, particularly in asset management. This paper provides a comprehensive review of the opportunities and challenges associated with integrating blockchain in asset management practices.

3 Methodology

Our project demanded versatility, prompting us to harness the power of local networks built through inventorying virtual machines across our laptops. This decentralized approach facilitated rapid inventorying and experimentation, empowering our team to iterate swiftly and adapt to evolving requirements. We conducted the asset management tasks on virtual machines to simulate a dynamic and scalable environment, which allowed us to efficiently manage and evaluate various assets. To begin with, we used tools that are widely known in the industry like Lansweeper and Spiceworks to create an inventory of all hardware assets which was maintained with a lot of scrupulousness. Every team member had several VMs running on their laptops, those were the lab equipment we built, emulating a diverse but robust virtual network. It was via Lansweeper and Spiceworks that we were able to reach such depth for virtual machine hardware configurations (in addition software) that our inventory became very accurate, up-to-date. The setup allowed us to model real-world scenarios and gain insights around the challenges of managing disparate hardware assets in a sandbox environment. In addition to managing hardware assets, we focused on maintaining an inventory of software, services, and systems managed by the organization. Utilizing tools such as Microsoft SCCM (System Center Configuration Manager) and PDQ Inventory, we developed and updated a comprehensive inventory of software applications and operating systems deployed across our virtual machines. This process involved meticulous tracking and documentation of each software asset, ensuring that all applications were accounted for and their configurations were accurately recorded. The use of these tools allowed us to streamline the software inventory process and maintain a high level of accuracy and consistency. Additionally, we kept an inventory of the offerings from suppliers, chronicling all outsourced utilities, such as cloud-based and third-party benefits. Leveraging cloud administration platforms similar to CloudHealth and provider oversight platforms, we recorded these utilities to make sure a complete comprehension of external relies. This methodology was indispensable for pinpointing likely hazards linked with third-party utilities and guaranteeing that every outside possessions were suitably oversaw and tracked. Furthermore, it empowered us to consistently survey changes to outsider administrations and screen new openings. On occasion, longer sentences were utilized to shed

light on intricate relationships between inner and outside elements. In the meantime, shorter expressions gave important subtleties and emphasis when important. Our asset management process has always revolved around the categorization and prioritization of assets which is based on their criticality relative to business activities. Tools like Qualys is employed in asset categorization, while customized spreadsheets are used for asset prioritization. As a result of this structured classification and ranking, resources could be allocated efficiently and high-priority assets which were exposed it was rendered invincible from risk. This method of categorization was based on painstaking analysis of each individual asset's role in the organization, its importance to crucial business activities and what would be lost or impaired by its failure. Priority levels was allocated to each asset, thus creating a clear hierarchy which would then be reflected in resource allocation and risks management efforts. In addition, we have also focused to maintain data and accompanying meta data inventory for specific data types. In this article, we have used Data Loss Prevention (DLP) solutions like Bulk Extractor and Exiftool or to identify, classify and keep an inventory of critical data and meta data. It involves tight documentation of data types, where they are kept and permissions for accessing them—ensuring sensitive information is fully protected and maintained. The inventory of data and meta data has been kept continually updated to take account of changes in data usage, storage or classification. This in turn serves as a dependable source for data management and security policies. Also among our methods is the management of equipment lifecycle from procurement to scrapping. We used IT Asset Management (ITAM) solutions and Endpoint Central for lifecycle management, enabling us to follow assets through all their lifecycle stages. This approach meant that assets are managed efficiently, from when they are acquired and deployed to the maintenance, and on to eventual disposal-fundamentally in line with best practices on asset management. Lifecycle management meant planning the acquisition of assets, putting strategies into play to make them run effectively, and setting down rules for their decommissioning and disposal. This way, we made the most out of each asset and minimized potential risks associated with later asset obsolescence or failure. Besides fulfilling the NIST CSF as our standard, our method also introduced novel tools and means to enrich our management of assets. By taking advantage of virtual machines, building subnets on Microsoft Azure, and utilizing a suite of industry standard tools, we created a dynamic and scalable Asset management system. This approach also helped us to achieve a thorough understanding of the University's assets in promoting good practice. And because it was so closely integrated with other core processes, we were able to ensure that all those objectives aligned effectively together. The insights gained from this methodology will aid in understanding how asset management contributes to the NIST CSF as well as offer practical guidance for those undertaking similar tasks in their own environments. Under this complete methodology it is particularly important to be flexible and open in managing the assets of an educational institution in such a dynamic environment combining its diversified features. The combination of virtualized environments, refined tools, and a systematic process ensured precision in the University's asset management and brought about good effects in overall terms. This methodology indeed serves as golden rule–learned from its success can be

applied elsewhere. And by integrating innovative technology with strategic thinking we show that an organization of any size can fulfill both management goals and cultural objectives [12–19].

4 Asset Management Tasks and Tools

The format of the outcome is as, Task followed by tool followed by the results.

A. Inventories of Hardware Managed by the Organization.

Task: Compile and regularly update a detailed inventory of all hardware assets.

Tools: Lansweeper, Spiceworks for asset management.

Results and Outcomes: Efficient asset management is vital for organizational success. This part outlines our use of Lansweeper and Spiceworks to optimize asset management processes. Lansweeper provides detailed network inventory and software tracking, facilitating informed decision-making and proactive monitoring. Spiceworks complements Lansweeper with help desk ticketing and contract management features, enhancing collaboration and cost optimization. Additionally, Lansweeper enhances cybersecurity through regular vulnerability assessments. Continuous optimization efforts are essential for maximizing value. By leveraging these tools, we aim to elevate efficiency, effectiveness, and long-term success in asset management.

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Tools: Lansweeper, Spiceworks for asset management.

Results and Outcomes: Efficient asset management is vital for organizational success. This part outlines our use of Lansweeper and Spiceworks to optimize asset management processes. Lansweeper provides detailed network inventory and software tracking, facilitating informed decision-making and proactive monitoring. Spiceworks complements Lansweeper with help desk ticketing and contract management features, enhancing collaboration and cost optimization. Additionally, Lansweeper enhances cybersecurity through regular vulnerability assessments. Continuous optimization efforts are essential for maximizing value. By leveraging these tools, we aim to elevate efficiency, effectiveness, and long-term success in asset management (Figs. 1 and 2).

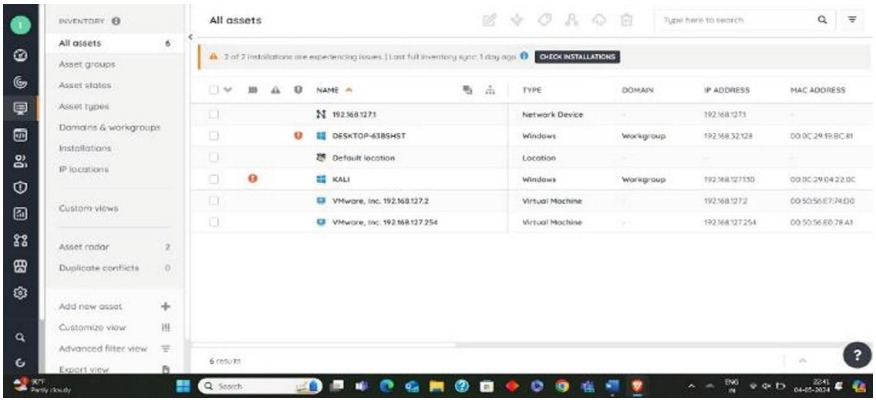


Fig. 1 Hardware inventorying with Lansweeper

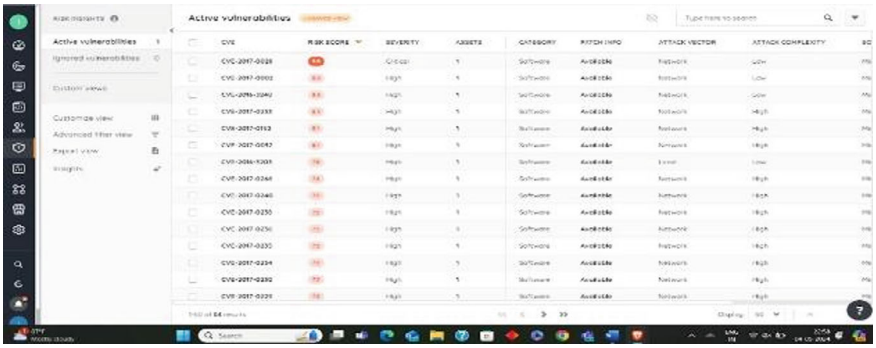


Fig. 2 Vulnerability assessment with Spiceworks

Other several promising features of Lansweeper includes Software Inventorying, Network Inventorying, Help Desk, Ticket System. Whilst The Spiceworks comes with few more features like Contract Management, Vulnerability Assessment along with strong insights, auto-generated reports.

A. Inventories of Software, Services, and Systems Managed by the Organization.

Task: Develop and update a comprehensive inventory of software applications and operating systems.

Tools: PDQ Inventory.

Results and Outcomes: PDQ Inventory is a systems management solution that allows IT administrators to scan their network and collect hardware, software, and Windows configuration data. It scans Windows computers to collect hardware, software, and Windows configuration data and can be used to create reports and collections. Administrators can use PDQ Inventory to remotely restart or shut down

systems, use Wake-on-LAN to boot offline PCs, send commands to target computers and use Remote Desktop and other remote control tools (Figs. 3 and 4).

The advantages and applications of the PDQ Inventory can be summarized as, it covers Patch Management, custom reporting and filtering, automation and scheduled tasks, integration with Active Directory, scalability.

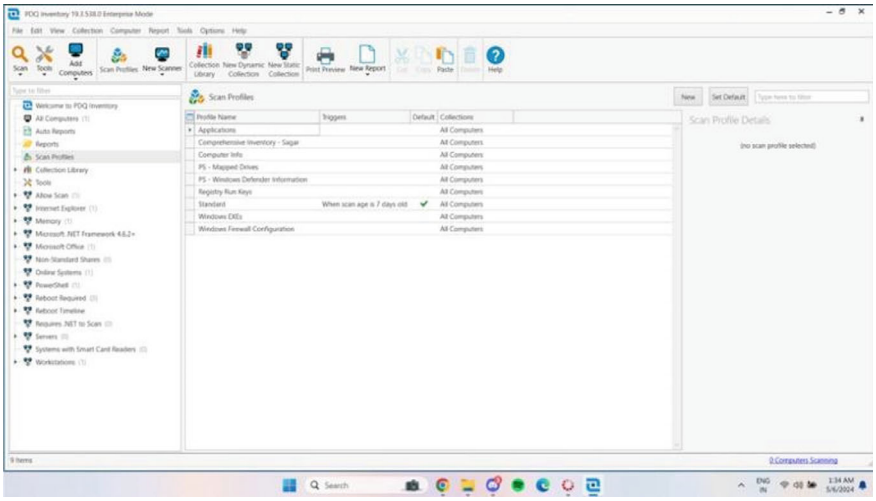


Fig. 3 Scan profiles in PDQ inventory

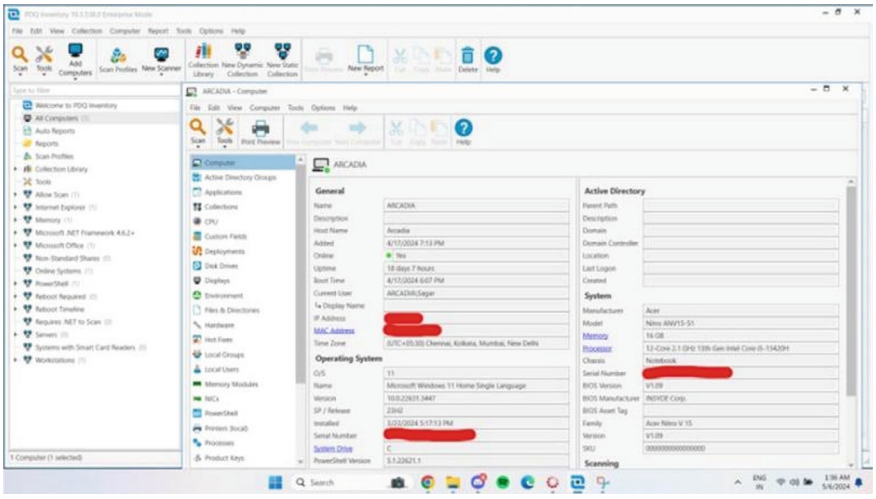


Fig. 4 Results after inventorying software and hardware

B. Representations of the Organization's Authorized Network Communication and Internal and External Network Data Flows

Task: Map and document internal and external data flows to understand data transmission paths.

Tools: Nmap and Wireshark for network analysis.

Results and Outcomes: The task is to analyze network traffic and communication logs to identify authorized data flows and potential deviations. We have done thisscans on the subnets created over Azure AD (Fig. 5).

Nmap provides a high-level overview of network devices and services. For in-depth data flow analysis, Wireshark is a more suitable tool (Fig. 6).

Wireshark captures actual network traffic, providing a detailed picture of data flow compared to Nmap's high-level scan results. However, due to the volume of captured data, Wireshark requires focused filtering and analysis for effective use.

```
┌──(guyver㉿kali-vm)-[~]
└─$ sudo nmap -sT 20.33.53.54
[sudo] password for guyver:
Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-04-17 21:42 IST
Nmap scan report for 20.33.53.54
Host is up (0.24s latency).
Not shown: 999 filtered tcp ports (no-response)
PORT   STATE SERVICE
22/tcp open  ssh

Nmap done: 1 IP address (1 host up) scanned in 78.99 seconds
```

Fig. 5 Nmap port and service detection



Fig. 6 Wireshark flow analysis



Fig. 7 FlexReport in CloudHealth

C. Inventories of Services Provided by Suppliers

Task: List all external services, including cloud and thirdparty services.

Tools: CloudHealth, vendor management systems.

Results and Outcomes: Effective management of supplier services is essential for ensuring that external services, including cloud and third-party services, meet organizational needs and performance standards. CloudHealth by VMware is a powerful platform that provides comprehensive visibility, optimization, and governance for cloud services, making it an ideal tool for managing supplier services. CloudHealth offers several key features that contribute to the effective management of supplier services such as visibility and insights, cost management and optimization, governance and compliance, risk management and reporting (Fig. 7).

CloudHealth by VMware is a valuable tool for managing supplier services, providing comprehensive visibility, cost management, governance, and risk management capabilities. Its use has led to enhanced control, cost savings, improved compliance, and proactive risk management, contributing to the overall success of managing supplier services in the organization.

D. Assets Are Prioritized Based on Classification, Criticality, Resources, and Impact on the Mission

Task: Classify and prioritize assets based on their criticality and impact on the business.

Tools: Qualys for asset classification, custom spreadsheets for prioritization.

Results and Outcomes: Qualys comes with a scanner appliance. With these we can assess different asset categories, ranging from home networks to large distributed

networks. It allows us to evaluate internal network devices, systems and web applications (Figs. 8 and 9).

E. Inventories of Data and Corresponding Metadata for Designated Data Types

Task: Identify, classify, and maintain an inventory of critical data and metadata.

Tools: Bulk Extractor and Exiftool, for data classification.

Results and Outcomes: Bulk extractor is a C++ program that scans a disk image, a file, or a directory of files and extracts useful information without parsing the file system or file system structures. The results are stored in feature files that can be easily inspected, parsed, or processed with automated tools. Bulk extractor also creates histograms of features that it finds, as features that are more common tend to be more important (Fig. 10).

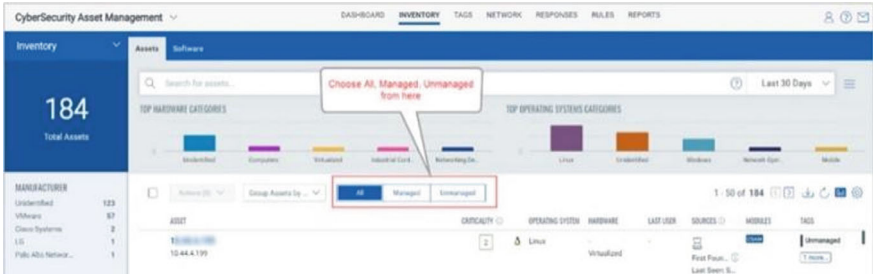


Fig. 8 Qualys asset classification I

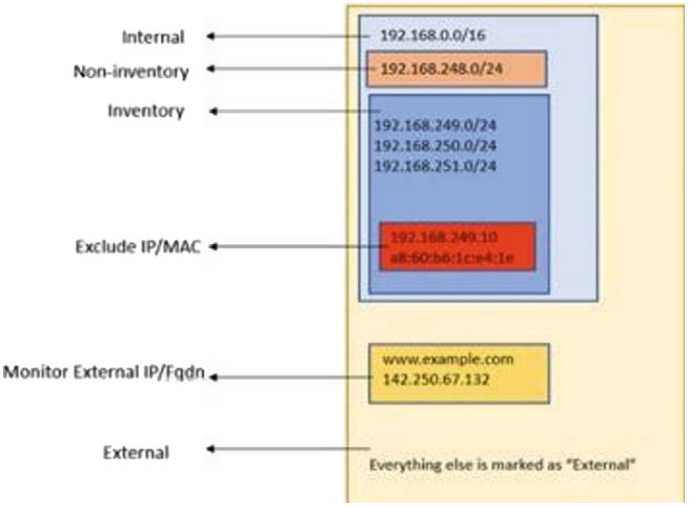


Fig. 9 Qualys asset classification II

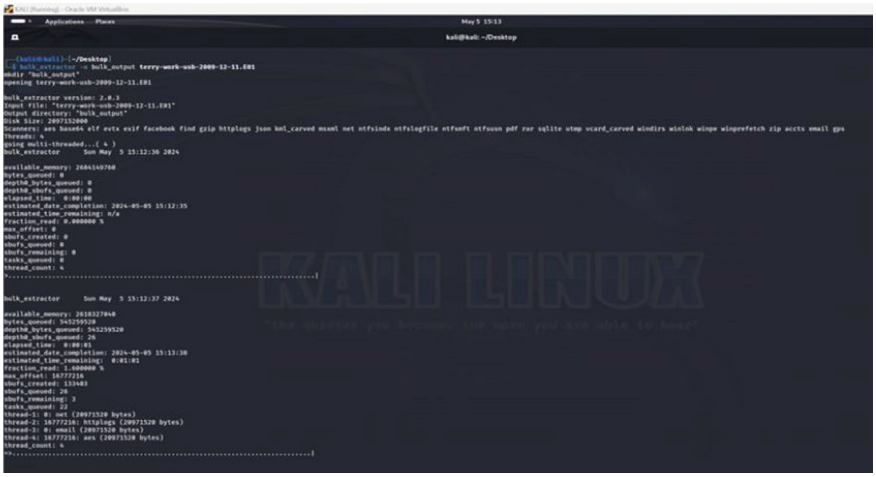


Fig. 10 Extracting data with help of bulk extractor

ExifTool is a command-line tool that allows you to read, write, and edit metadata in various file types, including images, documents, and audio/video files. You can use it to extract metadata associated with designated data types. Extracting metadata from Photos using ExifTool (Fig. 11).

F. Systems, Hardware, Software, and Services Are Managed Throughout Their Lifecycle

Task: Manage the lifecycle of systems, hardware, software, and services from procurement to disposal.

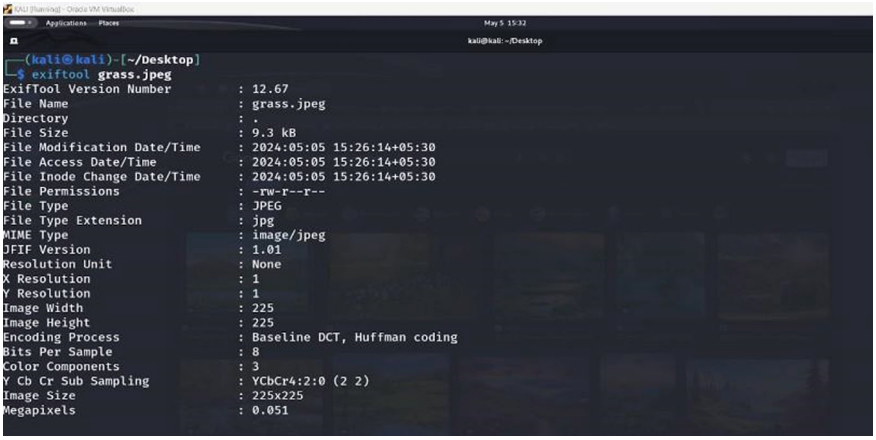


Fig. 11 Exiftool

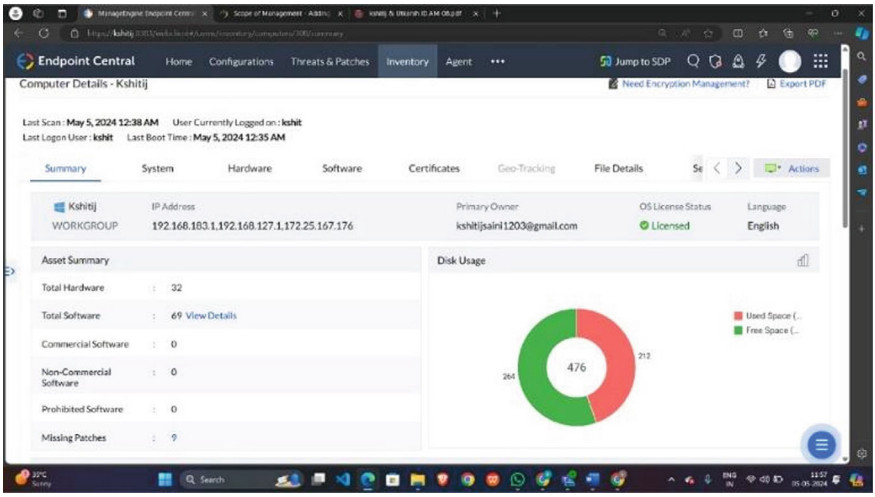


Fig. 12 Asset summary of deployed device

Tools: ITAM solutions, Endpoint Central for lifecycle management.

Results and Outcomes: Endpoint Central facilitates comprehensive lifecycle tracking by monitoring asset warranties, maintenance schedules, and depreciation. Organizations leverage Endpoint Central's analytics to optimize asset usage, identify opportunities for consolidation or retirement, and plan for upgrades or replacements based on lifecycle projections. Secure disposal practices are also facilitated, ensuring proper data erasure and compliance with regulatory requirements for asset retirement (Figs. 12 and 13).

Endpoint central comes with bunch of features like detailed license reporting, invoice information, battery information, hard disk information, processor information, health graph, network patch graph, and many more.

6 Best Practices and Recommendations

For those interested in implementing effective asset management strategies by using industry standard tools it is necessary to plan carefully, monitor continuously and adhere to best practices. With the ongoing and significant use of various tools such as Lansweeper, Spiceworks, PDQ Inventory, Wireshark, CloudHealth by VMware, Qualys, Bulk Extractor, ExifTool, and Endpoint Central, the we have devised a set of recommendations. Combining tools can increase the effectiveness of the tools and provide a more comprehensive view of asset management. For example, combining Lansweeper's inventory capabilities with Spiceworks' help desk and

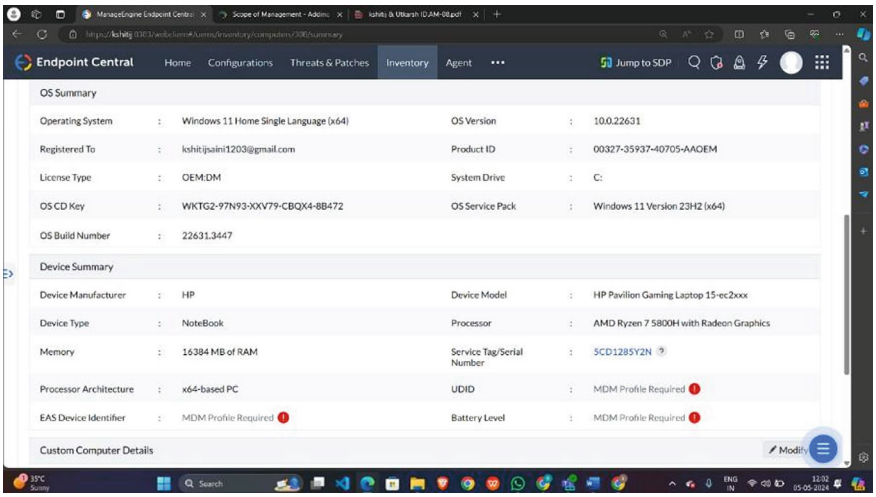


Fig. 13 OS summary of deployed device

contract management modules can improve both asset tracking and service management. As another example, one can integrate PDQ Inventory with Active Directory to ensure consistent user and asset management. Communicate clearly and set expectations with vendors. Use a tool such as CloudHealth to monitor and manage third-party services to ensure performance and security compliance. Regularly review service level agreements and performance metrics to maintain high standards.

Use automated features in tools such as PDQ Inventory or Endpoint Central to schedule regular maintenance tasks, update tasks, and vulnerability scans. Automating processes can reduce the amount of manual time required and ensure that important exercises are performed consistently and in a timely manner. Remember that asset management is an ongoing effort and will need continuous updates. Review asset management practices consistently to adapt to and take advantage of the increasing number of products and tools. Train employees on asset management tools and best practices to make sure that they are being utilized properly and effectively. Carefully document all asset management processes and the tools that are used. Regularly produce and review reports to monitor asset performance, see trends, and make informed decisions. Cultivate and embrace a culture of collaboration and communication within the organization. Encourage multiple departments (IT, operations, finance) to work together to manage assets. If everyone involved knows the asset management practices and policies in place, that will lead to both better compliance and efficiency in the organization.

7 Conclusion

Asset management is an essential aspect for the effective operation and success of an organization. It is imperative for an organization to have an accurate inventory of all assets, to monitor and maintain all the assets, to make data-driven decisions and to adhere to industry regulations. Integrating asset management enables organizations to have a better understanding of asset utilization and performance, enables proactive monitoring, risk management, and compliance. Through this study, the importance of continuous improvement, automation, and having an up-to-date inventory were discussed and these practices improve operational efficiency and the implementation of a successful ISMS. In sum, asset management practices support the organization, provide visibility into utilization, enable optimization of costs, and enable the organization to have an understanding of the performance of their assets to make informed decisions for future goals strategically. The asset management principles and methodologies provide a solid foundation for the recognition that asset management has evolved into a proactive, forward-thinking, risk- and performance-based area. Organizations must leverage these principles to sustain assets, manage their performance, and make better, more confident decisions that will result in continued achievement in an environment that is highly dynamic and competitive.

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Differences Between Geographical Indications and Trademarks: An Analytical Study of Practical Applications, Legal Protection, and Digital Transformation

Omar Al Makhzoumi and Salma Fathy Abdel Qader Abdel Halim

Abstract This research explores the distinctions between geographical indications and both individual and collective trademarks in relation to intellectual property rights. The objective is to elucidate the differences among these various types of intellectual property. Findings indicate that geographical indications identify products based on their geographical origin, whereas trademarks serve to differentiate products and services more broadly. Additionally, the research reveals that individual trademarks are owned by a single entity to distinguish its offerings, while collective trademarks are shared among multiple entities to differentiate the products of their members. The legal distinctions are emphasized, highlighting that while trademarks can be licensed, geographical indications cannot be, and the latter benefits from perpetual protection. Through practical examples, including the Cajamarca case in Peru, the research demonstrates how to distinguish between a geographical indication and a trademark. It also advises companies and farmers on selecting the appropriate intellectual property form according to the product type and target market, and advocates for the registration of geographical indications to bolster the protection of local products and enhance consumer trust. Moreover, the emphasis is placed on the accurate registration of both individual and collective trademarks, ensuring clarity between these trademarks and geographical indications. It advocates for a reassessment of the laws that safeguard these rights to align them with international standards and prevent deceptive practices. Given the rise in digitalization, the study also recommends the incorporation of digital tools and platforms into the registration and monitoring processes for geographical indications and trademarks. This integration would not only simplify the registration process but also improve transparency, ease access to global markets, and offer stronger protection against digital

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violations. Additionally, the proposal includes utilizing blockchain technology for verifying authenticity and traceability, which would bolster consumer confidence in products with geographical indications.

Keywords Geographical indications · Trademarks · Intellectual property rights · Individual trademarks · Collective trademarks · Legal protection · Distinction · Rights registration · International laws · Digital transformation · Blockchain technology · Digital infringement

1 Introduction

Geographical indications and trademarks fall under the umbrella of intellectual property rights, each providing its owners with the right to exploit them. Nevertheless, a geographical indication differs from a trademark. Trademarks can further be categorized into individual trademarks and collective trademarks. What defines each of these categories, and what criteria are used to differentiate between them?

Trademarks are categorized into individual marks and collective marks. An individual trademark is described as "any mark used or intended to be used on any goods, or in connection with them, to indicate that those goods belong to the owner of the mark by virtue of their manufacture, production, certification, trade, or offering for sale" [1].

Conversely, a collective trademark is described as "a mark utilized by a legal entity to authenticate the origin of goods not produced by itself, the materials used in their creation, their quality, the production methods, or the accuracy involved in their manufacturing, along with other attributes of those goods, such as the (ISO 9001) mark" [1, 2].

The ownership structure distinguishes an individual trademark from a collective trademark: an individual trademark can be held by either a person or a company, whereas a collective trademark is jointly owned by several entities, including groups of institutions or unions. Furthermore, unlike an individual trademark, which requires the owner's consent for any transfer or assignment, a collective trademark can be transferred or assigned without the necessity of such permission [2].

With the advent of the digital age, the differentiation between geographical indications and various types of trademarks becomes more complex due to the growing prevalence of digital platforms and technologies in commerce and the management of intellectual property. By incorporating digital tools for the registration and monitoring of these intellectual property rights, their protection can be improved, safeguarding ownership rights in the digital landscape and preventing consumers from being deceived by counterfeit or unauthorized goods.

Consequently, this research seeks to examine the distinctions between Geographical Indications and Trademarks, emphasizing their legal, practical, and digital ramifications.

1.1 Study Objectives

- Identify the differences between geographical indications and trademarks (both individual and collective) in terms of their definition and function.
- Explain the criteria for distinguishing between geographical indications, individual and collective trademarks and patents.
- Provide practical examples illustrating how GIs and trademarks are used in both global and local contexts.

1.2 Study Methodology

The research utilized a descriptive-analytical methodology to examine the distinctions between trademarks, both individual and collective, and geographical indications within the framework of intellectual property rights. This particular methodology was selected for its capacity to deliver an accurate and thorough analysis of the legal concepts and variances between these two forms of intellectual property. By employing a descriptive-analytical approach, the study facilitates an objective evaluation and interpretation of the existing data and information, aiding in the clear differentiation of each type of intellectual property right and emphasizing the legal and practical disparities that exist between them.

2 Distinguishing Between Geographical Indications and Individual Trademarks

Jordanian law characterizes a trademark as "any visible sign used or intended to be used by any person to distinguish their goods or products or services from those of others" [3]. According to the Supreme Court of Justice, a trademark consists of "letters, designs, marks, or a combination of these elements with distinguishing (distinctive) characteristics in a form that ensures the differentiation of the owner's goods from those of others" [4]. Professor Dr. Samihah Qalioub describes a trademark as "any sign or indication placed by a trader or manufacturer on the products they sell or produce to differentiate these products from other similar goods" [5]. Dr. Salahuddin Al-Nahi defines it as "a sign used to label goods, products, or services to distinguish them from similar goods from other traders or industrial producers" [6]. Dr. Salah Zainuddin states that it is "any sign used or intended to be used by any

person to distinguish their goods or products or services from those of others" [7]. Finally, Dr. Naseem Khaled Al-Shawawra defines a trademark as "any visible sign (which can be embodied) that allows the manufacturer, trader, or service provider to distinguish their products, goods, or services from similar or comparable products, goods, or services from others" [8].

As previously described, a geographical indication serves as a reference or symbol utilized by a producer to differentiate their products, inherently tied to a unique attribute of the item based on its production location. Most legal frameworks stipulate that for a geographical indication to receive protection, it must have been recognized in its country of origin. Conversely, a trademark refers to any symbol employed by a trader, producer, or service provider to set their goods or services apart from those offered by other traders.

Trademarks can incorporate geographical indications as long as they contribute distinctive characteristics that differentiate them from similar trademarks within the same nation, and the products labeled with this geographical name truly come from that specific location. If not, we risk encountering a trademark for goods that do not actually originate from the named country, which amounts to a form of fraud and deception.

The differentiation between trademarks and geographical indications is essential when a geographical name serves as a trademark to identify goods or products associated with that particular region. In these instances, it is necessary to ascertain whether it qualifies as a trademark or a geographical indication.

In order to clarify this confusion, the TRIPS Agreement mandates that member nations must reject or annul the registration of a trademark if it includes a geographical indication that deceives consumers into thinking the product is safeguarded in another country. This requirement is also outlined in Article (4) of the Jordanian Geographical Indications Law [9].

Upon reviewing additional legislations, it becomes evident that Egyptian law allows for the registration of trademarks featuring a geographical indication [10]. According to Article (112), any party with an interest can initiate legal action in the appropriate primary court through standard procedures to prohibit the use of any geographical indication not part of a registered trademark if such usage deceives the public about the actual origin of the products. The relevant primary court is identified as the one situated within the area where the geographical indication is utilized.

3 Distinguishing Between Geographical Indications and Collective Trademarks

Both collective trademarks and geographical indications serve to authenticate the quality and attributes of products. In certain instances, a country may seek to monopolize the rights linked to a particular geographical indication in order to build

consumer confidence in these products and fulfill commercial objectives. To accomplish this, the country might implement a collective trademark for a product that features a geographical indication. This approach offers further safeguarding for the geographical indication and limits its application to the country of origin.

Residents of a region that employs a geographical indication to identify its products are not restricted from utilizing a collective trademark alongside the geographical indication. This arrangement guarantees that the unique characteristics of the products are preserved while granting exclusive rights to the products from that particular area when they are brought back to it [11].

Therefore, the distinction between a geographical indication and a collective trademark lies in the fact that a geographical indication is not possessed by any particular individual or organization, while a collective trademark is held by either a public or private legal entity. As a result, the holder of a collective trademark enjoys exclusive rights, which are not afforded to a single person.

Individuals residing in areas characterized by notable geographical indications can secure exclusive rights through a collective trademark, as outlined by the applicable collective trademark system. They must register this trademark in accordance with relevant legislation to guarantee that production adheres to the established quality standards and system, while also safeguarding their traditional manufacturing expertise handed down through generations. Typically, the application of a collective trademark serves to protect those from a particular region, provided they form an association that utilizes the collective trademark as a unique identifier for their products and services.

The situation in Peru regarding the "Cajamarca" issue illustrates this point, as the town is recognized for its dairy product production. Its name is linked to items like cheese and butter, attributed to the unique geographical traits of the area. Local producers established an organization known as the "Cajamarca Dairy Producers Association," which created a collective trademark for its members who manufacture dairy goods with unique characteristics. This initiative enhanced their ability to market and safeguard their products while ensuring quality through a specific collective trademark system. Consequently, they gained extra protection for their offerings, which included both the safeguarding of the geographical indication and the collective trademark, allowing them to monopolize and defend their products within the region.

By utilizing a collective trademark alongside geographical indications, small businesses can lower expenses and boost their competitiveness. This strategy offers further differentiation for their products and services, enhancing consumer trust in these offerings through the combination of both a collective trademark and a geographical indication.

The connection between collective trademarks and geographical indications illustrates how the former enhances the latter in terms of production and competition, a function that a standard trademark cannot provide. Nevertheless, nations such as the United States have broadened the scope of protection for geographical indications via a certification mark system, which permits these indications to be registered as

certification marks. This approach safeguards all products and services linked to a particular region by granting them certification mark status [11, 12].

A noteworthy discussion has emerged concerning the connection between geographical indications and collective trademarks, highlighted by a case from Peru involving the Combi Valley. This valley is renowned for its production of "cherimoya," a fruit that possesses unique characteristics specific to the region. Matildo Pires, an individual from the area, aimed to register "Cherimoya Combi" as a trademark with the National Institute for the Defense of Industrial Property, reflecting the name of the geographical location. The registrar indicated that while it could be recognized as a place of origin, such a designation would not confer exclusive rights to the producers, as those rights are held by the state. As a result, Pires proceeded to register it as a collective trademark, which is governed by the self-established regulations of the village members.

Following this thorough examination of the meanings of geographical indications and the categories of trademarks, both individual and collective, the distinguishing criteria between geographical indications and trademarks can be outlined as follows:

1. **Functional Criterion**: A trademark's role is to act as a sign or name that differentiates similar products from one another. Conversely, geographical indications serve to identify a particular region associated with a product renowned for its superior quality, arising from its geographical setting.
2. **Geographical Origin Criterion**: Goods and products that carry a trademark do not need to be manufactured in a designated region. For instance, cars branded with the Mercedes-Benz trademark are produced in various countries. Conversely, products that feature a geographical indication must be created or made within that particular geographical zone. Therefore, if a product is not made in its designated area, it does not meet the qualification.
3. **Scope of Use Criterion**: Trademarks serve to differentiate similar services, while geographical indications are not applicable to services. Rather, they are utilized to set apart agricultural, industrial, and artisanal products made in particular regions from those created in different locations. This distinction is evident in the TRIPS Agreement, which employs the term "goods" instead of "services."
4. **Legal Nature as a Right Criterion**: A trademark can be involved in licensing agreements, allowing the owner to authorize a licensee to utilize the trademark for differentiating their goods or services for a designated timeframe in return for a fee, while still maintaining ownership. In contrast, geographical indications cannot be licensed out due to their inherent ties to their geographic origin and the impossibility of monopolizing them. Article 8 of the Jordanian Geographical Indications Law, which addresses the safeguarding of geographical indications, indicates that the methods of protection vary greatly from those applicable to trademarks, which are secured through registration. Instead, geographical indications receive protection via civil lawsuits, highlighting their public character. According to Article 8 of the Jordanian Geographical Indications Law, "8. A. The interested party may file a civil lawsuit to prevent infringement on a geographical

indication…" This "interested party" encompasses anyone with a legal stake in the issue or those who might suffer from an infringement.

5. **Substantive Criterion**: Trademarks, in contrast to geographical indications, are required to fulfill certain criteria, including distinctiveness, novelty, visual perceptibility, legality, and, in some instances, the necessity of being expressed in its original language. Geographical indications, however, are exempt from these requirements apart from legality. Instead, the regulations stipulate that the indication must be connected to a specific geographical area, with its quality being tied to this location.

4 Criteria for Distinguishing Between Geographical Indications and Patents

According to Article 2 of the Jordanian Patents Law No. 32 of 1999, an invention is described as: "Any creative idea reached by an inventor in any field of technology relating to a product, a process, or both, which practically solves a specific problem in any of these fields," while a patent is defined as: "The certificate granted to protect the invention" [13].

According to the definition provided, an invention refers to any innovative concept conceived by an inventor in any technological domain concerning a product or its methodology. The primary requirement for obtaining a patent is novelty, which signifies that the inventor has developed something original that has not been previously accomplished by anyone else.

A patent is a certificate awarded to safeguard an invention, provided by the state to an inventor who fulfills the legal criteria necessary for its issuance, thereby granting them the legal right to the protection afforded to their invention. According to Dr. Samira El-Kiloubi, it is described as: "The certificate granted by the state to the inventor, which entitles them to exclusive and financial exploitation of their invention for a specified period and under certain conditions" [5, 14].

Regarding the conditions for obtaining a patent, the Jordanian Patents Law specifies:

1. **Novelty**: The condition of novelty for patent eligibility indicates that the concept behind the inventor's creation must be original, meaning it has not been previously utilized by others or patented. If this condition is not met, a patent cannot be issued [15]. The Jordanian Court of Cassation has stated: "The envelope intended for patent registration by the appellant lacks the characteristics and qualities of an invention, failing to present a new application of a known means for industrial purposes. The various uses of envelopes represent an established and ongoing practice, which involves attaching a white piece to the opening of the envelope to write the recipient's name each time it is reused. In contrast, an invention should offer a novel idea that surpasses existing industrial practices and enhancements, resulting in increased production or providing technical or economic benefits in

the industry, typically achievable through standard skills or technical knowledge" [16].

According to the Jordanian Patents Law and its accompanying executive regulations, individuals who intend to showcase an invention potentially eligible for a patent at any officially recognized exhibition, whether domestically or internationally, can receive protection for a duration of up to six months. This timeframe, however, is calculated from the priority period, which is defined as the one-year timeframe outlined in Article 3 of the Jordanian Patents Law.

2. **Involvement of an Inventive Step**: Beyond the requirement of novelty for patent eligibility, an invention must also demonstrate an inventive step that surpasses the typical level of industrial advancement. In simpler terms, for a patent to be awarded, the invention should not be apparent to an individual with expertise in the relevant technological area.
3. **Industrial Applicability**: To receive legal protection under patent law, the final requirement is that the invention must be applicable in an industrial context. Inventions that cannot be utilized within industry, such as a specific machine, product, or chemical substance, do not meet the criteria for patent eligibility. Patents do not extend to abstract concepts, purely scientific theories, or mathematical and computational formulas, regardless of their scientific significance. Likewise, discoveries pertaining to natural phenomena and their governing laws are not eligible for patent protection, irrespective of the research and effort invested in uncovering them. For an invention to be eligible for protection, it must demonstrate an application of these scientific ideas or theories through the production of a new product or the development of a novel industrial process [5, 17].

Patents and geographical indications are both intellectual property rights within industrial context, but they differ in four key points:

1. **Duration**: While a patent grants a temporary right, a geographical indication is typically viewed as a lasting protection, as most laws do not establish a specific time limit for its validity.
2. **Innovative Basis**: A patent is based on an innovative idea, while a geographical indication does not require novelty or innovation.
3. **Exploitation Rights**: A patent grants the owner the right to exploitation and exclusivity, whereas a geographical indication grants only the right to exploitation.
4. **Territorial Principle**: The principle of territoriality in patents dictates that an inventor is granted protection solely within the nation where the patent has been registered. This means that an individual in a different country, where the patent is not registered, can create the same product without violating the patent. On the other hand, geographical indications usually enjoy international protection that extends beyond the country of origin.

5 Criteria for Distinguishing Between Geographical Indications and Industrial Designs

Industrial designs represent a category of industrial property that, similar to other types of industrial property, encompasses intellectual creations utilized in industrial endeavors. Their distinction from artistic works lies in their intended function: a design is deemed an industrial design if it is developed for industrial manufacturing. Conversely, when a design serves to fulfill aesthetic or artistic preferences, such as a statue by a sculptor or a piece by a painter, it is regarded as purely artistic work and does not fall under industrial property classification. This differentiation is referred to as the criterion of purpose [18].

In Jordan, industrial designs are regulated by the Industrial Designs Law No. 14 of 2000. Article 2 of this law defines the terms as follows [5, 19]:

- Industrial design: Any design or layout of lines that imparts a unique or particular look to a product, whether produced by machines or crafted by hand, encompasses product designs.
- Industrial shape: A three-dimensional shape, regardless of its connection to lines or colors, that offers a distinctive look suitable for industrial or artisanal applications.

The criteria that distinguish geographical indications from industrial designs are as follows:

- **Shape Criterion**: Products often benefit from industrial designs that incorporate appealing shapes to entice consumers, resulting in a preference for one item over similar alternatives. A consumer may select a product based on its attractive lines, colors, or overall aesthetic, even if it lacks quality, as its visual appeal can overshadow the superior quality and materials of competing products [20]. Conversely, with geographical indications, the shape of the product does not provide any extra benefit; instead, it is the esteemed geographical origin that draws consumers' attention.
- **Ownership Criterion**: Geographical indications represent a type of industrial property right that solely permits the owner to exploit it. In contrast, industrial designs are registered under the manufacturer's name, signifying that ownership lies entirely with the designer, who retains rights to use, exploit, and dispose of the design [20].

6 Criteria for Distinguishing Between Geographical Indications and Certificates of Origin

A Certificate of Origin serves as a document that identifies the nationality of a product for specific reasons, including the assessment of applicable duties or preferential treatments. Issuance of these documents falls under the jurisdiction of the Chamber of Commerce in the exporting nation. Typically, this document encompasses details such as the place of manufacture, product number, quantity, weight, type, date of manufacture, and validity. It can be described as "the information provided on goods for clarification purposes" [21].

In order to prevent redundancy, a definition of geographical indications will not be included here, as it has already been addressed earlier. Both Certificates of Origin and geographical indications serve as labels on products, potentially leading to consumer confusion because of the challenge in differentiating between the two. Nonetheless, distinctions do exist, which are outlined as follows [22]:

1. **Objective Criterion**: The aim of employing a geographical indication is to signify the specific region where a product is well-known. Conversely, a Certificate of Origin serves to pinpoint the manufacturing location along with additional consumer-relevant details, including the product's weight, intended use, and its manufacturing and validity dates.
2. **Ownership Criterion**: As noted earlier, geographical indications represent a type of industrial property right that allows the owner to exploit it exclusively. In contrast, a Certificate of Origin grants its holder the rights to exploit, use, and dispose of the product.
3. **Legal Protection Criterion**: Given their significance, geographical indications are safeguarded by particular laws that fall under international protection, as outlined by the TRIPS Agreement. On the other hand, Certificates of Origin are governed by laws and regulations related to consumer protection.

Thereupon, a geographical indication or geographical statement serves as a label on products that possess a distinct geographical origin along with qualities, reputation, or characteristics largely associated with that origin. Generally, a geographical indication encompasses the name of the originating location and can apply to a wide range of goods, including agricultural, natural, or manufactured items.

Conversely, a specific category of geographical indication that signifies origin is applied to products possessing unique characteristics or attributes primarily linked to the geographical environment of their production. Designations of origin fall under the broader concept of geographical indications.

A trade name refers to a designation utilized by a merchant, whether an individual or an organization, to set their enterprise apart from others [23]. This name aids in distinguishing the business from similar entities, facilitating recognition for customers who favor it. As the quality of the products provided by a business enhances its reputation, the trade name increasingly becomes linked to that quality and rises in popularity [24, 25].

Trade names and geographical indications represent two categories of labels that can occasionally intersect, particularly when a trade name serves as a designation for a geographical location or a particular geographical indication linked to the products or goods available to consumers. This intersection may result in confusion among consumers. Thus, it is essential to delineate the distinctions and criteria for differentiating between the two, outlined as follows [23, 25]:

1. **Fame Basis Criterion**: A trade name gains its reputation from the quality of the products provided to consumers, whereas the recognition of a geographical indication arises from the unique human and natural characteristics that set a particular region apart from others [26].
2. **Legal Protection Criterion**: The protection of geographical indications stems from international treaties, particularly the TRIPS Agreement, to which member countries are obligated. On the other hand, trade names are afforded protection at the regional or national level, independent of international accords.
3. **Naming Criterion**: In trade names, it is common for the name to feature the innovator's first name along with their surname. In contrast, a geographical indication denotes a specific region recognized for its production of a distinct product characterized by certain qualities.
4. **Registration Criterion**: Trade names are officially registered with the Chamber of Commerce and Industry. Although geographical indications do not fall under the Jordanian Geographical Indications Law, they may be registered in accordance with trademark regulations if such registration takes place.

7 Conclusion

This research offers an in-depth insight into the distinctions between trademarks and geographical indications, underscoring the ways these differences can affect intellectual property rights and the safeguarding of products. By employing a descriptive methodology for thorough analysis, the study has highlighted the distinct features of both geographical indications and trademarks along with the legal protections they provide.

7.1 Findings

The study concluded with the following results:

- A geographical indication serves as a marker for products linked to their specific geographic origin, whereas a trademark is employed to differentiate various products and services more broadly.

- A personal trademark is held by one organization and serves to distinguish its products, whereas a collective trademark is shared among several organizations and is utilized to recognize the goods of its members.
- While trademarks are subject to licensing, geographical indications cannot be licensed. Tied to their geographic origin, geographical indications enjoy indefinite protection, in contrast to patents, which offer only temporary safeguarding for inventions.

7.2 Recommendations

- Companies and farmers should choose the appropriate form of intellectual property rights depending on the type of product and target market.
- Registration of geographical indications is advisable to provide additional protection for local products and increase consumer confidence.
- When registering individual and collective trademarks, care should be taken to avoid confusion with geographical indications.
- Countries should review and update their laws on the protection of geographical indications and trademarks to ensure compliance with international standards and prevent consumer confusion.

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Digital Twin Application and Facilitation in the AEC Industry's Operation and Maintenance Stage



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Abstract Digital twins are transforming various industries by enabling data-driven decision-making and enabling efficient operations. However, research on digital twins often focuses on specific sectors, leaving untapped potential across a spectrum. This paper aims to address these challenges by highlighting the pivotal role of digital twins in converging cyber-physical data for sector-specific applications. Drawing on prior research on big data and digital twin technology, the paper presents a cross-sector perspective, introducing innovative applications in sectors like healthcare, energy, and transportation. The research encourages cross-sector collaboration, innovation, and unlocking the potential of digital twins in diverse domains. By exploring the possibilities of digital twins in diverse domains, this research encourages organisation to harness their power for enhanced efficiency, intelligence, and sustainability, shaping a brighter future for industries worldwide.

Keywords Digital twin · Industry 4.0 · Virtual representation · Cyber-physical system · Digital-twin driven design · Sustainability · Technological progress

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1 Introduction

Artificial intelligence, as we know it, is the idea and advancements in computerized systems development that are able to both imitate and stimulate human behavior and thought, thereby becoming more like humans than completely replacing them [1]. As well as carrying out activities requiring voice recognition, language translation, and visual perception etc [2]. From 1956 onwards, artificial intelligence (AI) research has flourished in creating perceptive systems that authorize robots to do not just all physical labor but also thinking, presaging, and decision-making. AI systems use human thinking processes as a guide to produce more accommodating and useful tools instead of striving as to create an ideal clone of the mind human [3]. For this particular reason, including ongoing developments in processing power, big data processing, Applications of artificial intelligence (AI), pattern recognition (PR), and machine learning (ML) are starting to permeate every aspect of our everyday lives and provide a wide range of unexpected advantages [4, 5]. The primary goal of developing AI algorithms is to identify and simulate real-world scenarios. These scenarios could involve, for instance, human reasoning in the context of medical research, modeling biological structures, or developing computer-aided diagnostics procedures [6, 7]. By studying human organs, or reducing data dimensions to eliminate redundant information, these algorithms can reveal underlying information and hidden patterns that are within the data, encoded. The proliferation of the Internet of Things (IoT) in recent years, created a multitude of avenues for data sharing across different sources.

In reality, the spread of technologies and the internet-connected embedded sensors and actuators enable the ongoing transfer of huge data. This time span relates to the scope of records (high dimensionality, requiring massive amounts of data to be stored), range (facts that are heterogeneous and belong to different resources), pace (speed of creation and acquisition, as opposed to long processing times), and cost (the significance of the information conveyed through facts). Fortunately, advances in cloud computing, high-dimensional data processing, massive facts analytics, and statistics fusion methodologies allow for the acquisition of critical information and the optimization of physical systems' performance through shopping and trouble-some large statistics. Two dimensions have been replaced by three dimensions in the definition of a digital product. Digital prototypes, digital mockups (DMU), and other technologies centered around product layout have been proposed by the company. With time, there has been progress in the definition and expression of product design. The 3-D digitalized product version has evolved, and its benefits have been repeatedly validated, as evidenced by the recent successes of both domestic and international production industries [8].

3D printers and reliance on artificial intelligence will have a promising future in scientific research and global development to achieve sustainability, with its positive impact on society This requires attention to artificial intelligence and significant investment in technology infrastructure [9].

In summary, the creation of one of the major technological achievements in the sector is attributed to the combination of big data, AI models, and IoT for processing,

together known as Digital Twin (DT). These digital twin models are becoming more and more popular due to the rapid advancement of technology, as well as their potential and significant application field effects. The definitions of digital twin technology are wide because of its constantly changing nature. It is possible to federate data from several digital twins to create a synthesised representation of various real-world entities, such as a production facility, smart building, application device, and their corresponding sub strategies. Furthermore, if we discuss the current situation, there are several issues with the definition of digital products, such as poor descriptions, omissions of the production definition, operations, and occasionally maintenance stage. The description of the product and process are not related, and subsequent stimulations based on the "ideal definition" offer little direction for the actual results.

The "Digital twin" technology was created in order to address the issues raised above. According to [10], this technology turns out to be among the best options available to address the issues raised and transform how aircraft manufacturing is handled going forward.

2 Research Background

NASA has been developing mirrored systems since 1970 in order to keep an eye on physically inaccessible areas, such spacecraft on missions, in order to troubleshoot and come up with fixes. One famous instance is the virtual world created for the Apollo 13 mission in 1970. When an oxygen tank ruptured two days after launch, NASA's flight control crew in Houston utilized a mock-up of Apollo 13 to assess the situation and come up with a temporary air purifier. This demonstrated how virtual models, which are regarded as preliminary forms of Digital Twins (DTs), may be used to connect virtual and real environments. Nevertheless, a crucial component of DTs was absent from these models: a smooth link for real-time data flow. In 2002, Michael Grieves gave a talk on product lifecycle management (PLM) and unofficially introduced the DT idea. Grieves outlined the three main components of DT: a physical item in a real area, a virtual object in a virtual environment, and a connection that allows information to travel between the two locations to help with synchronization [11].

Around 2012, NASA researchers, in a seminal roadmap, suggested that DT could enhance aviation performance. They defined DT as an integrated, ultra-realistic, a vehicle or system's simulation, considering various interdependent systems. This marked the beginning of DT development for space assets, leading to the concept of the Tail Number-Specific Computer Model for Individual Aircraft, known as the Airframe Digital Twin (ADT). The terms "Digital Thread" and "DT" were used interchangeably by the U.S. Air Force in 2013, emphasizing their historical memory and ability to leverage knowledge for system prognosis. While some distinguish Digital Thread from DT, both concepts gained interest beyond aerospace, becoming integral to Industry 4.0 and Smart Manufacturing. The Digital Thread primarily focuses on linking product data throughout its lifecycle, providing a consistent representation.

However, it lacks the monitoring, maintenance, and optimization capabilities of the physical system, which DT incorporates. The latest developments consider DT as the next Generation Digital Thread, surpassing its predecessor in capabilities. This study differs from existing reviews by not restricting itself to specific application domains and considering various domains in detail. The methodology involves a systematic literature review without a specific time frame, and the study explores sociotechnical design implications, focusing on the interaction of domain experts, designers, and stakeholders with machines. Additionally, the study is centered on the concept of Digital Twin linked to AI, acknowledging the influence of various disciplines in DT development [12].

3 Literature Review

The process of the digital twin concept has its origins in Grieves' discussion about PLM, or Product Life Cycle Management, in the year 2003, although its maturity was hindered by technological limitations at that time. With advancements in processing technology (such as cloud computing), and data gathering (such as IoT), and simulation technology, the digital twin concept has evolved into a more sophisticated and specific form. While industry and academia offer varied definitions, In general, a multiphysics, multiscale, probabilistic, integrated simulation of a system or final product is referred to as a digital twin. By utilizing existing models, historical data, real-time data, and other resources, it simulates the life of its physical equivalent. As currently understood, a digital twin is an interactive, electronical, and physical depiction of the whole life cycle of the product. The digital twin has drawn more attention since it may offer a product's whole digital footprint from conception to the conclusion of its existence. Initial applications were centered around product prognostics and health management (PHM) in industries such as aviation. Notably, General Electric utilized digital twin technology to predict the health of its products, enhancing accuracy in operations and maintenance. It's crucial to distinguish the digital twin from the cyber twin, which is rooted in the concept of Cyber-Physical Systems (CPS). While cyber twin exists within the cyber space of interconnected objects, a complete digital twin necessitates both physical and virtual models with interactions between them, emphasizing collaboration between physical and cyber spaces. As smart manufacturing emerges with the integration of new IT, the digital twin plays a pivotal role, serving as an epiphany for the intelligent sector. Cybernetics: the study of control and communication in machines and living things, forms the theoretical foundation for digital twin development. Smart manufacturing is emphasized by national plans like Industry 4.0 and CPS-based manufacturing, which has led to the adoption of digital twins in production phases. Applications for digital twins have mostly concentrated on the manufacturing and post-production phases, with the design process receiving less attention. This study highlights digital twins' application in the phase of product design, realizing the enormous potential in this field and attempting to offer a model framework for product design driven by digital twins (DTPD) [13].

Digital twin (DT) concept was proposed to describe the engenderment and genuine-time virtual presentation of products. However, due to the techno level at that time, this concept didn't receive enough attention. Wei Yong and others put forward a technique to recognise the digital twin's visualization version through the use of web offerings and interpreted truth era. Chen Wanling et al. received device facts by way of including sensors to realise facts and fusion, so that it will build a digital dual version of the system device. There always exist a digital world that supports and serves the physical world, and as a result of that, the physical world works more efficiently and orderly. As a result, the digital twin technology emerged, which is now extended from manufacturing to urban areas and has an important effect on the planning, building, and advancement of urban areas. Professor Grieves initially presented the idea of a "digital twin" at a University of Michigan Product Lifecycle course in 2003. Later, the US Department of Defense brought DT to problems with spacecraft health maintenance, among other organizations and enterprises in other domains. A digital replica, linked information, identity, and the ability to monitor in real time are the four essential components that a digital twin technology needs to function, according to Gartner. Instead of being physically represented, entities in digital twins are digitally resembled. Digital twins combine the physical and virtual worlds using a single data source and are focused on the full life cycle of an aircraft. The practical and physical models created during the phase of design serve as the primary foundation for the virtual twin's construction. In the use phases and manufacturing that follow, facts and statistics interact with physical entities to perpetually improve the virtual twin's integrity and accuracy, which eventually results in a physical representation of the entity that is both accurate and whole [14].

4 Research Progress of Digital Twins

A "conceptual ideal for PLM reality mirroring" was presented through Michael Grives of Michigan University in 2002 at a Product Lifecycle Management presentation. "Mirror version" and "mirror version of recordings" were later modifications. He chose "virtual double" in 2011. The National Air Force and Space Administration's Phoebus Apollo Challenge is where the idea of virtual "twins" was first used in production (NASA). "Almost better: stimulating innovation and lean product due to PLM" is the explanation given for the recently adopted abstract model known as the digital dual. In an effort to address the drawbacks of craft remodeling, the United States of America Air Force style laboratory projected and similarly progressed the virtual twin in 2011. Associate in Nursing fashion forecasting in the globe and the context of the providers of the complex destiny. In 2025, they want to produce a brand-new orbiter model as well as a digital model that is identical to the physical product—the digital twin. The US Air Force has been in charge of Lockheed Martin, Boeing, biochemist Grumman, Fashion Electrical, and Pratt Whitney since 2014, variety of other and several others teams to hold outdo a number of analysis activities carried out, that had consequences. Among them, the standard-hosted f35 mid

airframe virtual index company received the 2016 national defence production era award. Timely real-time scrutiny and retention forecast through its platform cloud carrier Predix, the use of large statistics, the Internet of Things and other cutting edge technologies that are mostly dependent on digital twins. On March 1, 2017, he oversaw the preparation and release of the "CYBER PHYSICAL GADGET WHITE PAPER" (cps) under the direction of the Minister of Business and Data Age's information computer code program, which is the second business branch of the national needs committee [14].

5 Literature Works

Based on the papers and the research that have already been done in the field of this emerging AI technology, the digital twin, there are following few questions that will be referred in this paper as:

- RQ1: A comparative literature analysis of few works already done and what are the outputs produced?
- RQ2: What are the emerging applications of DT?
- RQ3: What can this paper contribute within the technological advancement of digital twins?
- RQ4: What are the major roles of digital twin driven services that help in leading a better life?

6 Comprehensive Study

This section clearly answers the RQ1. This survey paper has been written by the collection of relevant works, papers and thesis for assessing digital twin driven designs and its manufacturing in focus. This paper comprises of the comparative study of the works that have been done in the field of development of digital twin driven devices. As per the papers considered a comparative study of all the points have been done thoroughly and the results have been produced on the basis of it in the form of Table 1.

Application of Digital Twin Technology. The major aim of this section is to respond to RQ3

From the analysis we came across the fact that there are a several applications of DT that include Automobile, retail, Industrial IOT, and a lot more. There are a few existing applications of digital twins that refer to a various specific and traditional fields and contexts that include:

- Healthcare
- Maritime and Shipping

Table 1 Survey of digital twin literature

S. No	Title	Definition	Application	Design	Implementation
1	[14]		✓		✓
2	[15]	✓	✓	✓	✓
3	[10]			✓	✓
4	[16]		✓		
5	[17]	✓	✓	✓	✓
6	[8]	✓			✓
7	[18]		✓	✓	
8	[19]			✓	✓

- Manufacturing
- City management
- Aerospace.

A description about few of the applications have been mentioned down based on the analysis.

(1) *Healthcare:* Digital twin use in the healthcare sector is a revolutionary clinical process that help and assist hospital management by enhancing the medical care and support to the patients by tracking and advance modelling of human body. These DT tools help in a lot of researches that help in study of diseases, their symptoms, cure, and the drugs that should be used or prohibited in the treatment. It also helps the physicians to provide patient-specific treatment and optimize the procedure for better outcome. Thus, we can also say that a DT model of a human body can help the doctors to discover the effect of any drug, surgery or other medical procedures over a patient body even before performing it in real.

(2) *Manufacturing:* In the industrial sector, the term "digital twin" refers to a virtual replica of a physically created product that is as-built, as-designed, and as-maintained, enhanced by real-time data processing and analytics upon precise configurations of any physical product, systems responsible for production, or equipment. On the basis of real-life implementations, manufacturers are to be considered as the new business models where they can sell services in lieu. Later they can utilize the digital twin to monitor and optimise the availability and optimise it on the basis of predictive capabilities of digital twin [16].

(3) *Automobile:* Now-a-days the development of automobile vehicles take place in virtual environment. This means that the DT Technology of any product comprise the entire car, its software, mechanics, physical behaviour and all the functioning related and responsible. This also allow the stimulation and validation of each step of the development so as in accordance to identify and analyse possible problems and failures that may be faced before even the production of real parts. This same principle implicit to e-cars as well as conventional cars too.

(4) *Retail:* Digital twins' technology has helped various companies and businesses to do progress. DT technology has been supporting the retail services since past few years. Retailers make use of digital twin technology to forge a delivery chain's implementation and determine where optimization is potential. The actual time visibility added by way of digital twins lets in stores to execute new non-linear supply chain achievement models, for instance, micro-success, or curb side pickup.
(5) *Industrial IoT:* Now a days the industrial firms are using digital twins for implementation of various new functions that help the industry to digitally observe, trace, and manage the systems. The digital twins record additional types of data in addition to operational data, such as environmental data like location, configuration, and financial models that help to predict future operations and anomalies [17].
(6) *City Management:* The development of smart cities and the lay down of foundation of the plans where the development of smart cities use IoT and Digital twin technology has helped in improving the economy, resource management done well, reducing environmental impact, and raising the standard of living for all citizens. A town model based on Digital twin concept may help the city planners and the policy makers to plan the development and creation of smart cities using the knowledge acquired from several intelligence systems and sensor networks. Their ability to make informed judgments about both present and future actions is enhanced by the data obtained by digital twins.
(7) *Aerospace:* From traditional air travel to advanced air mobility, digital twin design has helped to shape the way of air travel making it more convenient for the passengers. Thus, DT came out with a fly-it-before-you-build-it approach which helps to design the aircraft on a virtual ground and study all the complications beforehand only so as to find the countermeasures and develop the actual model. This approach also helps the air craft system engineering to produce results in shorter development time with lower risk level [18].

7 Role of Digital Twin

The digital twin is among the major concepts that is responsible for the revolution in a various industry that may include, aerospace, manufacturing, healthcare industry, marketing, and a lot more. According to [13] there are majorly 3 roles defines for Digital twin driven industry that are as:

(1) Stimulation, diagnosis, forecasting, and management of the creation process and behavior of the product in the actual world.
(2) Enterprise product innovation is driven by the fundamental promotion of the well-coordinated stages of a product life cycle.
(3) Laying down a foundation for the quality traceability process and continuously improving the product development by archiving digital product life cycles.

8 The Industry Trend of Digital Twin

According to research and markets, the global trends and forecasts for year 2021–2026 came out with a report that states out that "The global twin market was valued at USD 7.53 Billion in 2020, and It is Expected to Reach a Value of USD 46.08 Billion by 2026, Registering a CAGR of 35.01% Over the Forecast Period, 2021–26."

The adoption of such solutions is anticipated to be forced throughout the forecast period due to the surge in the use of technologies such as 3D printing, the growing trend of IoT solution adoption across many businesses, and the growing need for virtual twins in the pharmaceutical and healthcare sectors. The possible advantages of digital twins include enhanced workflow and communication across many teams, such as technical disciplines, sales and maintenance teams, and product design. As demonstrated by the US Air Force, which has recently designed and constructed new aircraft prototypes using DT to great effect. It would have taken decades to complete the product if this procedure had been based on conventional methods. Further IoT sensor availability has given tech entrepreneurs more opportunities to test and interact with integrated goods that have sensors built in. These sensors can provide timely maintenance and real-time recommendation system functionality. By pre-analyzing the real product throughout its development phase, DT technology aids in the creation of innovative physical product design throughout the product lifecycle. Within the Industrial Internet of Things, for instance, digital twin technology uses analytical software linked to smart sensor and network components to detect faults and modifications in massive mechanical equipment. The digital twin creation process is utilizing increasingly potent and advanced instruments. You may now create intricate what-if simulations and perform millions of simulation operations without exhausting the system by returning to the acknowledged real-world circumstances. Furthermore, the choice of possibilities is expanding along with the number of suppliers. Furthermore, digital twin simulations may now incorporate data from real-time asset monitoring technologies like forward-looking infrared (FLIR) and light detection and ranging (LEDAR). The industry is anticipated to expand as a result of several recent alliances and acquisitions. Waylay Digital Twin, Salesforce's potent no-code IoT asset monitoring solution, and Waylay, the company's best-in-class Salesforce implementation partner, announced their partnership in June 2021. The Waylay Digital Twin project will benefit from the decades of Salesforce expertise of certain implementation partners, sharpening their implementation and consulting abilities. The COVID-19 outbreak has resulted in the emergence of novel application technologies and market prospects that support market expansion and acceptance.

The use of DT technology in medical diagnostics is expanding extremely quickly. By modeling a specific patient's state and features using machine learning data gathered from several patients, digital twins upend conventional medical care. Thus, other patterns may also include,

- Surge in Adopting 3D technology in manufacture of anticipation to fuel the demand.
- Witness of significant market share by several countries.

- Growth of Digital twin technology in Industry 4.0

9 Contribution

This paper is an in-depth collection of all the current trends and the traditional developments iin the sector of industries driven by digital twins. This study infers to all the possible techniques that emerged in the realm of digital twin along section which elaborates on how the digital twin is being used in the recent years. This includes most of the findings, definitions, and applications of the other referenced researches and survey papers. On an whole, the paper has been organized in a way that it answers a few important questions that are based on the recent twins in the required field mentioned.

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Exploring the Use of AI-Powered Applications in Arabic Language Teaching and Assessment



Mohammed Saleem Ismail Al-Mallahma

Abstract The adoption of AI applications in Arabic language teaching and learning comes with its own advantages and disadvantages. This research tries to answer how effective these tools are in improving the quality of teaching and learning outcomes. Taking a qualitative approach, this paper adopts a descriptive method to review literature regarding the contribution of artificial intelligence tools in curbing plagiarism, developing writing, and improving language skills. The analytical approach weighs the benefits of AI against traditional methods while also considering the drawbacks. A general perception is revealed through this research that though artificial intelligence tools are welcomed by educators and learners, they require significant awareness, training aspects, as well as ethical considerations for optimum utilization. The findings provide crucial inputs into ongoing debates related to the role of AI in language education and come up with concrete suggestions meant for implementers, policymakers, technologists but more so for teachers.

Keywords Arabic language teaching · AI-Powered applications · Language assessment · Qualitative research · Educational technology · Language skills enhancement

1 Introduction

AI has received considerable attention in language education and comes with many advantages and disadvantages. The use of AI-powered applications in the improvement of efficiency and quality during research paper writing processes for instructors is quite promising. Evidence is the study applied in Majmaah University [1]. The

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integration of AI tools was viewed positively by EFL teachers in helping to streamline literature reviews, assist in data analysis, reduce errors, and improve general language quality. However, it indicated a greater need for acquaintance with current existing AI applications and stressed training and support for effective integration as well.

AI-based language learning tools have further been proven effective in different areas of reducing plagiarism, editing and revising, error correction and pronunciation such as eliciting responses from learners on the level of psychological factors like confidence and anxiety other than the improvement or harm done in order for them to report by themselves the impact on their experience with language learning. The most commonly used AI technologies should be known both by learners and teachers, to help derive maximum benefits from these tools that would be appropriate for selecting language learning preferences and needs. With the evolution of AI applications, collaboration between researchers and educators is important to integrate pedagogical knowledge for improving detection or recognition capabilities—considered essential for advancing AI in language education [2].

The integration of artificial intelligence tools in education will demand that teachers have a deep and practical understanding of the applications available by investing their time during training and later on after training support is offered to ensure mastery, and this mastery is put into practice. Continuous supporting educators will guarantee complete professionalism and help solve related problems. On another note, the conscience of upholding high ethical standards and commitment to quality education while integrating AI tools into the learning process remains imperative—thus, all AI tools should be evaluated rigorously to ensure that they are in line with educational objectives, plus prioritizing student needs [2]. Moreover, it is implemented by teachers playing an essential role in guiding learners through the labyrinth of AI tools by helping students select appropriate tools which will further enhance their language learning journey [3]. Getting to know the preferences, strengths, and weaknesses of every student helps the teacher to adapt their advice with personally viable recommendations supported by tailored solutions that work well in fostering positive learning. This ushers the students into an effective learning experience where they will be able to leverage AI tools fully while at the same time having their needs well taken care of [4]. To have artificial intelligence tools effectively introduced in education sector, enough knowledge is required about what is being used—and this is only possible through adequate training that would be sustained over time with continual support upon provision, not to forget upholding ethical standards plus quality. Learners would also need pedagogical guidance by educators who are not only knowledgeable but also committed towards ensuring learners choose from these resources those which best suit individual needs for optimal language learning experience.

1.1 Significance

The importance of this research is likely to have a contribution to Arabic language education as an emerging field by exploring the AIP-Apps role in teaching and testing. Because digital technology is transforming practices in every corner of the world, and due to the increasing role of artificial intelligence in this transformation, insight into how AI can be efficiently included in the teaching of the Arabic language will be very beneficial. The results provide rich insights into both the advantages and possible drawbacks concerning AIP-tools' capacity for increasing learners' commitment while boosting assessment accuracy and customizing learning experiences. In addition, such a study significantly contributes academic value since this specific issue has scantily been discussed regarding other languages in contemporary literature. This shall help guide educators, curriculum developers, or even policymakers into making informed choices concerning adopting AI technologies for effectively meeting Arabic language learners' specific needs and ensuring more productive and innovative teaching strategies are implemented.

1.2 Methodology

Such research shall be using a qualitative approach to investigate AI applications in the teaching and assessment of the Arabic language. The study shall use a descriptive approach in the systematic review of all available literature, both theoretical frameworks and empirical studies relating to the integration of AI in language education. This research involves an extensive examination of scholarly articles, case studies, and reports to identify and analyze the benefits, challenges, and implications of AI technologies in teaching the Arabic language. An analytical approach is used in synthesizing findings from the literature review that helps make a critical assessment of effectiveness and impact on AI-powered tools compared with traditional methods of teaching. The knowledge that comes out of this analysis will go a long way in enhancing insight into how AI can improve teaching and assessment practices for Arabic language education, hence useful for educators, policymakers, and technologists.

2 Language Teaching and Assessment Trends

AI-powered applications developed for language teaching and language learning represent one of the most important trends within education. The following AI tools have been developed to address different aspects of language learning: grammar, speaking, listening, writing, pronunciation, vocabulary plus reading. Such tools are reported to have a positive impact on psychological factors as confidence, anxiety

immersion and presence as learners [5]. In addition to such development, AI-based language tests (ALTs) were introduced as an alternative form of human-based language tests (HLTs), wherein automated systems score the performance provided by those undergoing the test [5]. Research revealed that there are different perceptions from those taking the test regarding its implementation with an AI in a Language Test concerning fairness reliability and consistency-worthy area thus requiring further exploration.

Teaching and assessing the Arabic language using traditional methods have long been the cornerstone of language education. However, with artificial intelligence-powered approaches being integrated, the process is revolutionized. Recent studies have drawn out educators' positive perceptions towards integrating AI tools in language teaching and assessment with an emphasized potential for improved efficiency, quality, and skills development in the language [6, 7]. AI-based language learning tools were found to bring about a marked reduction in plagiarism, improvements in editing time, error correction upon them, and attainment of greater levels of pronunciation accuracy from among positive learner perceptions as well as improved language learning experiences [6]. Making a comparison between traditional methods and AI-powered approaches stands to reveal the potential that AI tools have in streamlining language learning and assessment processes while also bringing about improvements in the quality of language with positive impacts on psychological factors such as confidence and immersion toward it. This underscores that familiarity with applications regarding AI is important alongside effective training and support for the successful integration of AI tools into Arabic language education [8].

3 AI Applications in Arabic Language Learning

The Arabic language learning domain is noticing big advancements with AI systems. These applications are used for improving language teaching and testing and offer different advantages to the learners. AI tools have proved a great decrease in plagiarism, an increase in editing and revision time, correction of errors in rhetorical function, as well as lexical usage and grammar [8]. It is also very effective in terms of pronunciation assessment, which assists the learners in fluency, comprehensibility plus tone and even pronunciation accuracy. Providing feedback as well as evaluating language skills has its bearing on psychological factors like confidence, anxiety plus immersion and presence that it carries. Moreover, natural language processing methods—a principal AI methodology—are widely applied in the interpretation of feedback from end-users for any industry, which helps firms to understand and act on textual data in multiple languages without much human effort [9]. The same AI applications have a potential revolutionary impact on the teaching and learning of Arabic as a second language, providing bespoke learning experiences and enhancing student performance.

3.1 Language Learning Platforms

The popularity of AI-powered language learning platforms for Arabic language teaching and evaluation has increased due to their capability to give personalized feedback and analyze language proficiency [10]. These platforms have several advantages, like decreasing plagiarism, increasing editing time, and correcting all types of errors in grammar as well as vocabulary and pronunciation. According to the learners themselves, AI tools are effective and easy to use, helpful in terms of language learning (specifically with fluency) and making oneself understandable while also getting the pronunciation correct. Moreover, it affects psychological factors of confidence, anxiety, immersion, presence which has a positive effect on their overall learning experience [11]. Moreover, the AI tools can be adjusted to work on different features of writing by providing individual corrective feedback for learners which contribute to vocabulary learning and help in the acquisition of collocations and idioms necessary for producing a native like Arabic language output. With advances in the functionality of these tools, they are very attractive new opportunities for language learners, which makes them a very important area in the process of teaching and diagnosing Arabic language.

3.2 AI in Arabic Language Assessment

Artificial intelligence has shown optimistic potential in changing the assessment of Arabic language proficiency. Integrating AI tools will make language assessment more effective and accurate and other advantages like efficiency, quality, and error reduction in assessment. These tools have been developed to target different language skills with the aim of making users proficient in speaking, listening, writing, pronunciation as well as grammar, vocabulary, and reading while being found effective and easy to use plus advantageous for learning a language [11]. They have also been reported useful in detecting mispronunciations by providing feedback related to different language capabilities; this contributes toward enhancing learners' language experiences and abilities. However, implications arising from the integration of AI tools into language assessment also raise concerns about ethical utilization that need to be considered along with issues regarding quality maintenance vigilance observed during an assessment process which calls for necessary action research development done regularly for improving effectiveness and accuracy. The integration of AI-based language assessment tools with Arabic language assessment is vital for both technological seamlessness and the establishment of ethical standards: innovation shall be driven by the quality of assessments provided. The rapid growth in AI technology will lead to further maturations of these tools, which can take a more holistic and sophisticated approach to appraising Arabic linguistic competencies [11]. Much more research and development work needs to be done to bolster the capability factors that underlie the feasibility prospects of AI-based language assessment tools in the sphere

of the Arabic language; this being so, ultimately, when due advancements are made, AI may help transform Arabic language assessment, making it efficient and effective in measuring progress for learners as well as teachers.

3.3 Automated Essay Scoring

AES is the process of using artificial intelligence technologies to evaluate essays written in Arabic. Research has cited that AES systems use a hybrid approach to its scoring: statistical features are computed based on sentence length, word count, and number of sentences, while content-based features are extracted using NLP libraries (e.g., word2vec). Neural network models have also been experimented within AES; however, these models are susceptible to adversarial responses where students try to game the system by entering irrelevant or even duplicated content. Notwithstanding these challenges, because of accurate essay ratings provided by AES, automated systems in educational spheres have gained tremendous demand [12]. Moreover, work on linguistic features in AES has been probed especially in the context of non-native learner essays. The features include lexical, syntactic, discourse as well as error types of learner language. These are utilized in the creation of predictive models for grading essays. AES is highly applicable in language assessment scenarios that include placement tests in language teaching institutes and providing writers with real-time feedback to enhance their use of the language [13].

4 Challenges and Opportunities in Implementing AI in Arabic Language Education

The use of AI in the implementation of applications for the teaching of the Arabic language has challenges and opportunities. A major challenge is that of the availability of resources and data in the Arabic language. This is very important for developing effective AI tools specific to the details of the Arabic language. Educators will also need to be more aware of these existing AI applications so that they can integrate them into their teaching and assessment processes successfully [14]. However, it would be quite advantageous if AI were used to improve the ways of teaching and carrying out assessments while learning the Arabic language. It could help to enhance efficiency and quality during research writing, assisting in data analysis, reducing errors, and enhancing language quality overall. Furthermore, it could promote smart education regarding precision, plus individualized learning with which it would meet different needs concerning learners pursuing the Arabic language. At the same time, there is a need to sensitize and train educators on the effective and ethical integration of AI tools during the training session.

The ethical issues related to using AI applications in Arabic language teaching and learning are not unidimensional. They are compound and manifold. An obvious issue that comes up is data privacy. This is because using AI as well as learning analytics would mean handling large volumes of personal data, which would raise the chances of privacy being compromised. This involves the ability to use past learning data for future predictions, which might be objected to by some students for whom data privacy is a concern they value highly [15]. Furthermore, the deployment of real-time facial expression recognition systems without taking consent brings more weighty ethical concerns on board. Transparency in using AI, taking consent with proper information disclosure, keeping extreme secrecy for building trust are major pillars, at the same time showing autonomy for students in AI-driven language education context. Also, algorithmic bias—which reflects the unintentional discrimination or favoritism inscribed within AI systems—needs to be thought of. Developers and educators should implement strategies that lead to bias-free AI algorithms to help every student reap the benefits of AI, irrespective of where they come from. The impact of AI on students and teachers alike also needs to be acknowledged. Ethical considerations go beyond ensuring student well-being to looking at how integrating AI can affect educators professionally and personally [16]. Balancing technological advancements with the ethical use of AI in language education calls for proper planning, evaluation, and strategies that prioritize responsible deployment as well as ethical considerations. In other words, the integration of AI-powered applications into Arabic language teaching and assessment raises numerous ethical issues that need careful consideration. Developers and educators should be ready to evaluate the ethics that entail the use of AI in detecting plagiarism in educational settings. Openness, consent, privacy (confidentiality), and anti-bias strategies are some of the ways through which positive technology can be realized, with an equal share of benefits for all students. Responsible and ethical AI application in language education is extremely important not only for building trust and protecting privacy rights but also for establishing an inclusive and equitable learning environment where both students and teachers are empowered [17].

5 AI Integration in Arabic Language Education

Two cases can be very informative in terms of integrating AI applications successfully in the field of Arabic language education. The studies reveal a lot of benefits and positive results that come about due to the use of AI tools in the process of learning and research. A case study at Majmaah University elicited the opinions, and perceptions of EFL faculty members on how they view integrating AI tools into the research writing process. It revealed that the integration of AI-powered applications greatly improved the efficiency and quality of the writing process [18]. The tools were very instrumental in quickening literature reviews, helping to analyze data, reducing errors, and thus enhancing language quality in research papers memorably. Similarly, an evidence-based systematic review was undertaken to assess the effectiveness and

usefulness of AI-based language learning tools. The findings of this review emphasized the significant impact of AI tools on language learning. The tools were found to effectively decrease instances of plagiarism and errors as well as to improve different language skills, including fluency, comprehensibility, and pronunciation accuracy [19]. Learners used AI-powered apps to improve their languages skills and managed to do so elegantly. Case studies stressed the innovative role that AI could play in transforming Arabic language education. When integrated with artificial intelligence, this is how both educators' and learners' ends meet improved results for research writing plus efficiency in language learning. The positive perceptions shown by EFL faculty members open up an optimistic future for AI in the field, which also brings newly tapped chances for students and researchers as well. With the increased use of AI tools, benefits will be more realized in the multi-dimensions of language education. This clearly ushers us into an era where innovation and improvement will take place.

The paper has presented some real-world examples and lessons learned regarding the successful integration of AI-powered applications in the teaching and assessment of Arabic language. A case study at Majmaah University revealed that faculty members from the Department of English have positive attitudes and perceptions toward integrating AI tools into the research writing process for which it cited an increase in efficiency, quality, and language perversity [20]. However, it did stress that such integration needed familiarity with existing AI applications coupled with necessary training and support to ensure effective functioning. In the same way, a systematic review found artificial intelligence-based language learning tools very effective in reducing plagiarism, improving time taken for editing and revising work, correcting errors, and improving fluency as well as other language skills like comprehensibility or pronunciation accuracy. It also warned that learners and teachers need first to be acquainted with these widely used AI technologies to reap the maximum benefits out of them [21].

6 Future Prospects

AI tools have been integrated into the field of language education and have shown considerable promise in improving different dimensions of language learning and assessment. With the rapid development witnessed in the AI domain, future endeavors of AI for Arabic Language Education might lead to building specific AI-based applications that cater to the Arabic language learner's unique linguistic features and learning requirements with targeted assistance in areas such as grammar, pronunciation, vocabulary building, and reading comprehension—reflecting specific challenges and opportunities available in Arabic language learning [22]. Another possibility for forthcoming innovations in AI for Arabic Language Education would be making use of natural language processing and machine learning methodologies to develop adaptive systems that offer personalized learning experiences to students, consequently allowing educators to give custom feedback and intervention considering individualized learning profiles [23]. Moreover, AI innovations in

Arabic language education could be extended to the area of assessment where AI-powered tools would facilitate automated assessment of language proficiency, give feedback in real-time on writing and speaking tasks, and provide information about students' development in the use of the language over time. Such advancements will cut down on the process of assessment channels, remove bias, and supply educators with data that is educatively useful for decision-making. However, educators have to be given proper training and support so that these AI tools are integrated effectively into their teaching and assessment practices—since this has a large amount weight on ethical use as well as maintaining quality of language education [23]. With the rapid growth seen now within many different sectors like artificial intelligence; further studies based on continuous development plus collaboration set between its developers alongside those working within educational system will play an important factor role while actively taking part during determination future that lies ahead meant developing such kind applications aimed at Arabic language education.

The revolution of AI-powered apps that are designed to adapt to individual needs and preferences and the offering of personalized content and feedback have injected a new lease of life into personalized learning experiences in Arabic language teaching. According to [24], such tools are very effective in decreasing plagiarism, improving the time required for editing work, correction of linguistic errors, and even the increase in positive psychological factors like confidence or reducing anxiety. In addition, as noted by [25], generative AI tools bring enormous benefits to L2 writing in terms of analyzing student texts and offering individualized feedback. These improvements do not only enhance language abilities but also have an impact on increasing students' motivation during learning processes.

7 Conclusion

The incorporation of AI-enabled tools in the teaching and assessment of the Arabic language has gains and challenges. Research has shown that teachers and students consider AI tools to be effective—as well as easy to use—for language learning and useful in areas where plagiarism can be decreased, writing enhanced, language skills improved, among others. But there is also a greater need for awareness with regard to existing AI applications and attention to ethical aspects so that these tools are effectively integrated. Also important is training (besides support) which goes a long way in harnessing the benefits of AI applications in language learning and language assessment. Because developments within the field of AI in language education are constantly evolving, it is essential for educators (as well as policymakers) to keep themselves updated about existing AI tools; this would hopefully also involve working together with researchers to enhance the efficiency and accuracy of these applications.

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Forensic Linguistics in the Courtroom: Analyzing Judge's Questions in DNA Test Disputes



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Abstract The present study is aimed at exploring the linguistic strategies through which judges elicit responses in cases involving DNA paternity tests in the courtroom. It will specifically focus on the following: what types of questions are asked by judges (open, closed, declarative, tag, modal, yes/no, choice, consultative), and how these question types affect communication and decision making. The paper draws upon data from transcripts of court sessions involving cases of paternity disputes to see how different techniques of questioning inform dynamics within the courtroom, influence the clarity of information exchange, and hence affect outcomes of paternity disputes. Results show that judges make deliberate and strategic use of their questions to bring out information and guide their way through technicalities while remaining fair and in control. Therefore, an understanding of the exact linguistic features characterizing questions posed by judges will help in understanding courtroom discourse, which has implications for legal practice and justice administration.

Keywords Forensic linguistics · Courtroom DNA test disputes · Communication

1 Introduction

The issue of paternity in a legal action is very important especially to the child. It is not only the question of ascertaining biological relationship but it is the substratum on which the child can base his claim for future, for access to a normal childhood, for family support and for inheritance rights. As was emphasized in the case of Francken

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v. State (1926), such proceedings have for their main object the determination of whether the defendant is the father of the complainant's child, which would impose responsibilities on the father and grant rights to the child [2].

The strategies judges employ while questioning have a great effect on how the issue of paternity is litigated in the courtroom. Our study delves into the specific strategies and linguistic subtleties that judges adopt in cases of DNA paternity tests before the court. Through a deep exploration of the organizational strategies of judges.

We will explore the use of open-ended questions, closed-ended questions, declarative questions, tag questions, modal questions, yes-no questions, choice questions, and consultative questions. Through this investigation, we seek to shed light on how judges strategically utilize different question types to elicit information, navigate legal complexities, and ultimately shape the outcomes of paternity disputes [2].

1.1 Research Objective

This study aims to analyze the linguistic features of judge's questions in court cases involving DNA paternity tests. The research will focus on how these questions are structured, the type of language used, and their impact on the clarity and effectiveness of the courtroom interaction. By examining these elements, the study seeks to understand how linguistic choices influence the communication and interpretation of legal evidence in paternity disputes.

1.2 Research Questions

What types of questions does the judge use during the paternity case, and how do these question types facilitate or constrain the responses?

- What are the lexical features of the judge's questions?

2 Methodology

2.1 Data Collection

The study is a qualitative one, proceeding from observing and collecting naturally occurring data in courtroom trials to their classification and description. The primary source of data for this study is court transcripts from paternity dispute cases involving DNA testing, specifically chosen for qualitative linguistic analysis. Data are analyzed in courtroom questioning, focusing on how judges' questioning varies in these cases.

All data are transcripts of several trials in criminal courts, randomly chosen from Lauren Lake's Paternity Court from 2013 to 2020.

2.2 Data Analysis

Courtroom trials are complex processes involving many participants with varied purposes. The solemnity, impartiality, and effectiveness of the trial process can only be ensured when all procedures are strictly followed. Judges must adapt to specific legal procedures by choosing different questioning patterns and strategies to achieve their communicative goals in various contexts.

Judges are essential in managing the complex aspects of the cases in paternity court, where emotions are high. Unlike other judges, they must balance gathering factual information with taking the parties' emotional well-being into account. To guarantee justice and compassion in their choices by analyzing the data collected for this study, we observe numerous types of judge questions in courtroom trials, especially in paternity cases. This requires a unique combination of empathy, sensitivity, and firmness to ensure both fairness and compassion in their decisions.

The steps of analysis first I gathered data from courtroom proceedings accessible on YouTube, focusing on cases revolving around paternity disputes and DNA tests. Second I then meticulously examined the questions posed by judges during these proceedings, categorizing them based on their types, such as open-ended questions, tag question etc., Furthermore, I conducted an analysis of the linguistic style employed by judges, considering factors like formality and word choice.

3 Literature Review

In "Dimensions of Forensic Linguistics" [8], John Gibbons delves into the strategic use of questioning within common law criminal courts, emphasizing its profound impact on witness testimony and trial outcomes. Gibbons categorizes various question types, including open questions that elicit detailed narratives, closed questions that limit responses, and leading questions that suggest specific answers, often challenging witness credibility. Tag questions, such as those using modal verbs and agreement tags, compel witnesses to confirm particular assertions, highlighting the coercive nature of such questioning techniques. In the words of Gibbons, power dynamics are always at play during courtroom questioning, with most witnesses feeling very much pressured, a factor that can influence the accuracy of their responses more so in cross-examinations. These questions, when strategically used, are meant for fact finding, bringing out any disparities there might be, and how they mold the perception of the jury. Gibbons calls for forensic linguistics to be well known through training and thus reduce biases for fair trials, cautioning that coercive questioning can make a lie out of the truth and influence the results of the trial [3].

In the same year, Malcolm Coulthard and Alison Johnson published their book "An Introduction to Forensic Linguistics," which investigates the intersection between language and law, focusing on the applicability of linguistic analysis to courtroom discourse, legal documents, and law enforcement interactions. They also consider the strategic use of questioning in courts; according to these authors, leading and tag questions can mold witness testimony and hence the outcome of a trial to a great extent. Coulthard and Johnson discuss different genres within the law to illustrate how each genre has its own linguistic conventions that manifest themselves in courtroom proceedings, legal documents, and police interrogations. They stress that legal language should be as clear as possible in order not to contain any ambiguity and that one should approach questioning techniques in a highly precise manner when wanting to shape narratives within a courtroom. Moreover, they touch on how important authorship attribution is in forensic science and emphasize that ensuring fairness and justice would need an eye for fine-grained linguistic details. Therefore, Coulthard and Johnson's book is, consequently, a work of reference in forensic linguistics that is very foundational, for it gives some very keen insights into how language can be strategically used within the legal domain [4].

The use of questions is the most potent tool for extracting information from witnesses and defendants. Al-Tarawneh underscores the role of questions in securing information from different players in the courtroom [8]. Catotot emphasizes that questioning is the essence of the legal process through which justice is done [9, 12] talks about how different types of questions are instrumental in molding courtroom narratives and outcomes. Hatab [13] investigated diglossia cases at courtrooms in Jordan [17]. Looks at how questions can actually be used to control the flow of information, and in turn, influence witness testimony [5]. In the paternity court, judges ask questions to bring out the truth about family relationships. The manner they frame those questions has to be gentle and precise to make things understandable and fair. This caution observed in questioning demonstrates the value of tailoring their approaches to the specific context in order to ensure justice and fairness.

4 Discussion

This section begins with the analysis of questions from Judge Lauren Lake in the Paternity Court.

Wh questions are questions that ask for information about the referent of the interrogative adverb or pronoun that initiates them. They can be open or closed.

- Open Wh questions

Open Wh questions (i.e. those about why? what? and how?) They may or may not be closed. In contrast to closed questions, open Wh inquiries (i.e., those concerning why, what, and how) allow for lengthier and more detailed responses. Their function is to request display of information, eliciting a story version.

Example

> Lauren Lake: Ms. Foster, tell us, why do you need to open your case?
> Ms. Foster: I'm opening this case today, because, Your Honor, I have a one-year-old child who we planned on having. She looks like him, she acts like him. He doesn't step up to nothing.
> Lauren Lake: How did this relationship even start?
> Ms. Foster: Ma'am, Your Honor, this relationship started through social media—We found each other—Oh, social media. We found each other through social media. So, we had a mutual friend. They vouched for him, said he was a good person. So, we jumped into a relationship.

The question 'why and how' by the judge seeks to understand the plaintiff's motivation for bringing the case to court and provides comprehensive answers, revealing important details about their relationship [6].

- Closed Wh questions

Closed-ended WH questions aim to extract particular details in order to give a narrative orientation, they request information about particular aspects such as who, whom, where, and when, focusing on precise details rather than encouraging elaborate responses. Example

> Lauren Lake: but what I want to understand is where you at the birth, Mr. Portis?
> Mr. Portis: No, I was not, Your Honor [14].
> Lauren Lake: Who was with you at the birth?
> Ms. Middlebrooks: My ex was. He stepped up.
> Lauren Lake: When your niece found out she was pregnant…who did she tell you the father was?

The judge's questions aim to extract precise information about particular aspects of the case, such as location, individuals involved, and timing. These closed WH questions help provide concise details, contributing to a clearer understanding of the events in question.

- Modal questions

Modal questions are questions that are embedded within a sentence and depend on a modal verb, such as can, could, may, might, must, will, would, shall, should, ought, and need. Modal questions are interactional structures used as politeness strategies to soften the impact of direct requests. Consequently, Danet considers them the least coercive questions that can be used in the courtroom (p. 521).

Example

> Lauren Lake: Ms. Brewington, you claim you are 100% certain that Mr. Lee is the father. Can you tell me how you know?
> Ms. Brewington: yes, your Honor. I am without a doubt 100% certain that he is my son's father. Not only was I only sleeping with him, we were actually working on our relationship. We already have a child from a previous situation. We got

back together. We're working on us. So, when I found out I was pregnant, I didn't think it was gonna be a shock or a surprise or anything like that.
Lauren Lake: Could you please describe your relationship with the mother of the child during the alleged conception period?

Lauren Lake, the judge, utilized a modal question to inquire about Ms. Brewington's relationship with the alleged father. The judge employed a modal question, "Could you please," to politely request Ms. Brewington to provide details about her relationship with Mr. Lee during the alleged conception period. Modal verbs serve as a polite means to request information from both the defendant and plaintiff, helping to maintain a respectful tone in the courtroom.

- Declarative questions

Declarative questions are declarative sentences with interrogative function and the high pitch associated with formal questions. They can be formulated positively or negatively. They are considered very coercive because the declarative form gives them the illocutionary force of statements more than that of questions [8, 10].

Example

Lauren Lake: You lost your family? You were married at the time? Explain.
Mr. Wiggins: Yes, Your Honor, I was married, um, and me and my wife went through a separation due to a rough patch. Due to my separation, you know, I became a little "antsy," I guess, for lack of better terms. Ms. Davis was working for a family member of mine and I'd seen her. Um, and she was looking good and she was walking up some stairs and she had on some really tight pants. And, uh, so I approached her. It was never supposed to be any type… Anything else more than just sex.
Lauren Lake: You didn't use protection?
Lauren Lake: How are you upset if you weren't in a relationship with her?
Lauren Lake: Did it cause the havoc or did you cause the havoc?

Notice the declarative form with an interrogative function in the first example, it is considered a coercive approach by providing clarification on his marital status, You were married at the time? the question here aims to elicit confirmation or denial from the plaintiff, A declarative question challenges the plaintiff's emotional reaction by asserting, "How are you upset if you weren't in a relationship with her?" this aims to emphasize a perceived inconsistency in the plaintiff's behavior and prompts him to provide an explanation [13].

- Tag questions

Coercive questions are tag questions with a distinct declarative/interrogative structure. Their meaning depends [1] on the interaction between the meanings of the interrogative and the declarative [11]. Tag questions are conducive because they combine a declarative sentence that states a proposition as true with a tag seeking confirmation. Despite much literature on tag questions, there is hardly any agreement regarding how

many types exist, how to classify them, or which tags are grammatically acceptable in English [7].

Classification of Tag Questions

Tag questions can be divided into grammatical tags and lexical (or invariant) tags. Grammatical tags are made up of a declarative sentence plus a question tag (auxiliary verb + personal pronoun) that matches the person and tense of the verb in the declarative sentence. Lexical tags are made up of a declarative sentence followed by either an impersonal or generic question (e.g., "Is it true?", "Is that right?") or an invariant tag like "right", "OK", "eh", etc.

-- Type of tag questions ➢ Modal verb tag questions

There are two types of modal question tag—reverse polarity and same polarity [18]. Reverse polarity tags are phrases or questions structured in a way that implies an assumption or assertion and seeks confirmation from the witness, defendant or plaintiff. These tags often use negative phrasing or tag questions to elicit a response that aligns with the interrogator's agenda. Same polarity tags may be used in the same way, but they are particularly used to cast doubt on the witness's version of events. Example.

(1) Lauren Lake: You knew about the pregnancy from the beginning, didn't you? (2) You were supportive throughout the pregnancy, were you?

The first question assumes that the respondent was aware of the pregnancy from the start and seeks confirmation, the second question assumes that the respondent provided support during the pregnancy and seeks confirmation.

Agreement tag questions

In this type use expressions such as "Isn't that right?" "am I right" and "is that correct?" Or simply "right?" or "true?" Like modal tags, they can have positive or negative connotations. Example.

(3) Lauren Lake: You claimed to have financial difficulties, isn't that right? The third question suggests that the respondent previously stated having financial difficulties and seeks confirmation of that claim.

Full verb tag questions

Where a full form of the verb rather than a modal verb is used. This hyper-explicit language places pressure on the witness, defendant, or plaintiff to reply in a similarly exact way, leaving no room for partial disagreement (John Benjamins 2008).

(4) Lauren Lake: You attended every doctor's appointment with her, did you?

The fourth question explicitly asks if the respondent was present at every doctor's appointment, seeking a precise confirmation.

Yes or no tag

Another unusual tag, explicitly demanding a 'yes' or 'no' reply, is the 'yes or no' tag.

(5) Lauren Lake: You were present at the birth, yes or no?

Tag questions in paternity courtrooms help clarify specific details and ensure that the testimonies are consistent and truthful. They often put pressure on the witness,

defendant, or plaintiff to confirm or deny statements clearly, making it easier for the judge to ascertain the facts of the case.

In paternity courtrooms, the style of questioning is intentional and strategic. Tag questions are especially coercive, often designed to corner the witness into a specific answer. This method serves several purposes. First, the structure of tag questions pressures the respondent to give clear, straightforward answers, reducing the chance for evasion or ambiguity. Second, the coercive nature of tag questions allows the questioner to control the testimony's flow, guiding responses to support their argument. Third, by combining a declarative statement with a question, tag questions push the respondent to confirm or deny specific facts, helping to establish a clear narrative. Lastly, with reverse polarity tags, the questioner implies belief in the truth of the statement, reinforcing the assertion and challenging the respondent to convincingly refute it [16, 18].

- Yes-No questions

Yes/No questions are polar questions that require a simple 'Yes' or 'No' response. They seek information but phrase the answer in such a way that the witness only needs to confirm or deny the underlying assumption of the question [7].

> Lauren Lake: you claim you desperately need to determine paternity so that you can file for the death benefits to support your family, is that correct.
> Ms. Cameron: Yes, your Honor.
> Lauren Lake: So, you have an older child together?
> Ms. Cameron: Yes. And then you planned for the next one.
> Lauren Lake: Hmm. You said you got pregnant on January 17th.
> Ms. Cameron: Yes.

Yes-no questions are designed to be answered with a simple "Yes" or "No." They seek to confirm or deny specific information, helping to establish clear facts by requiring the witness to agree or disagree with a statement. In paternity cases, Yes-No questions help clarify key details, validate claims, and ensure the accuracy of testimonies.

- Choice questions

In this type of question, the witness is presented with a choice between two alternatives, with no other responses permitted.

> Lauren Lake: were you ever able to prove or disprove that this really happened?
> Mr. Nicholas: No, ma'am. That's the problem. I couldn't, like…It's the allegation coming from other people, you know.

These questions help clarify specific issues by focusing the defendant's or plaintiff's response on a particular point of contention. They assist in maintaining control over the direction of their testimony, resolving ambiguities in their statements, and confirming specific details. ❖ Consultative Questions.

Consultative questions in the present study are taken as a means of seeking possible responses from the questioners, with which questioners can refrain themselves from

being subjective and biased. Considering the humane principles of the law, criminals, just like anyone else, have certain basic human rights, although they have the obligation to admit to their actions. Despite this, they differ in that they have to acknowledge the crimes they committed. In courtroom trial, consultative questions of this type are most often presented with the Have you ever been or do you have any new evidence?, do you have any evidence to prove? Or do you have any other opinions?, do you have any questions?, etc.… Lauren Lake: Have you ever been in any type of relationship with her?

Lauren Lake: Do you have any doubts or concerns about the paternity of the child?

The first question provides an opportunity for the alleged father to disclose any relevant past relationships or interactions that could impact the paternity case. The second question allows the alleged father to express any doubts or concerns regarding the paternity of the child, recognizing the complexity of such cases and promoting transparency and open communication [15].

5 Conclusion

In conclusion, the determination of paternity in legal proceedings is important for not only establishing biological ties but also shaping the future of the child involved, as the case of Francken v. State (1926) has shown. Judges have a direct hand in steering courtroom dynamics through their line of questioning during these proceedings. Our study explores the linguistic subtleties that manifest themselves in judges' questions while hearing DNA paternity test cases—open-ended, closed-ended, modal, declarative, tag, yes-no, choice, and consultative questions.

In our scrutiny of courtroom transcripts from cases of paternity disputes, we identified some of the questioning styles used by judges. Open Wh questions drew detailed narratives, closed Wh questions sought specific details, modal questions served as a strategy of politeness, declarative questions had an undertone of coercion, tag questions were often coercive also, yes-no questions sought simple confirmations, choice questions sought clarification on specific issues, and consultative questions promoted transparency and the spirit of open communication.

Overall, our research reveals how deliberate and institutionalized questioning is within paternity courts, seeking candid responses and shaping the narrative to support legal arguments. We may learn more about how communication impacts the interpretation of legal evidence and the outcomes of paternity contests by listening to the nuances embedded within the questions judges pose.

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The Impact of Transformational Leadership and Technology on Job Satisfaction Within Work Premises



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Abstract The research aims at looking at the impact of transformational leadership and technology on job satisfaction at the workplace. This was a cause-and-effect study wherein a questionnaire served as the primary data-gathering tool. The study population included a great number of employees amounting to 9000. For this research, 389 copies of questionnaires were sent to employees in the municipality from different levels via Google Forms, and all copies were returned completed; thus, making them 388 samples with valid responses. Findings revealed that transformational leadership is being practiced to a high extent, while job satisfaction was only found to be at an average level.

Keywords Transformational leadership · Job satisfaction · Transformational technology · Work premises

1 Introduction

Extensive research has been conducted on the concept of transformational leadership, which involves inspiring and motivating employees to surpass their own expectations. The focus of these studies has been on the effect of transformational leadership on job satisfaction. Numerous investigations have consistently shown a positive correlation between transformational leadership and increased job satisfaction in various industries and regions [6, 9]. This correlation highlights the significance of transformational leadership in creating a work environment that fosters employee satisfaction and ultimately leads to organizational success [3]. The influence of transformational

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leadership on job satisfaction has been tested in many organizational settings, highlighting its relevance in enhancing workplace results. But the specific need for a detailed exploration of the impact within the Greater Amman Municipality and other related sectors is important. According to [13], transformational leadership is very vital for efficiently managing big changes that improve the capability of an organization to deliver its roles and responsibilities [4].

The feelings that individuals have for their work, known as job satisfaction, is a complex and multifaceted issue. It involves many factors like the job itself, working conditions, relationships with colleagues and bosses, organizational culture, and opportunities for career development [5]. Typically, job satisfaction reflects positive affective states resulting from individual assessments of their jobs and work experiences. Conversely, when job satisfaction is low, it can give rise to negative attitudes towards the job or employer, which in turn can impact both organizational performance and the well-being of individuals [11, 13].

With the information presented, the objective of this study is to examine how job satisfaction in the Greater Amman Municipality is influenced by transformational leadership [1]. By narrowing the scope of investigation within this larger framework, valuable knowledge can be gained on the effective implementation of transformational leadership strategies to improve job satisfaction within the distinct organizational and cultural setting of the Greater Amman Municipality. The findings of this study have the potential to enhance our comprehension of the correlation between transformational leadership and job satisfaction in the Greater Amman Municipality in Jordan, as well as in comparable contexts throughout the region.

1.1 Research Questions

The study will address the main question: How does transformational leadership affect job satisfaction in the Greater Amman Municipality?

This main question is divided into the following sub-questions:

1. What are the levels of transformational leadership practiced within the Greater Amman Municipality?
2. What are the levels of job satisfaction within the Greater Amman Municipality?
3. What is the impact of transformational leadership on employee job satisfaction in the Greater Amman Municipality?

1.2 Importance of the Study

The primary objective of this study is to investigate the correlation between transformational leadership and job satisfaction specifically within the Greater Amman Municipality. This research endeavor serves as a valuable avenue to enhance the current theoretical framework by delving into the dynamics of this relationship within

a distinct municipal setting. By doing so, the study contributes to the existing body of knowledge and offers valuable insights that shed light on contextual factors that influence the efficacy of transformational leadership in fostering job satisfaction.

1.3 Objectives of the Study

The primary goal of this study is to examine the influence of transformational leadership dimensions on job satisfaction within the Greater Amman Municipality, as determined by the research questions.

1.4 Hypotheses of the Study

In light of the problem and objectives of the study, the researchers propose the following main hypothesis:

- **H.01**: "There is no statistically significant effect at the significance level ($\alpha \geq 0.05$) of transformational leadership dimensions (inspirational motivation, intellectual stimulation, individual consideration, idealized influence) on job satisfaction among employees in the Greater Amman Municipality."

1.5 Operational Definitions

1. **Transformational Leadership**: The Greater Amman Municipality has embraced a leadership approach that not only motivates and inspires its employees, but also drives them to surpass their own expectations and achieve remarkable outcomes, as evidenced by the study questionnaire's items (1–16).
2. **Job Satisfaction**: The study questionnaire measured the level of satisfaction and positive emotions that employees in the Greater Amman Municipality have towards their job roles, work environment, and overall job experience, specifically focusing on items 17–28.

1.6 Scope of the Study

- **Spatial Boundaries**: The spatial boundary of this study is the Greater Amman Municipality.
- **Temporal Boundaries**: The time frame is the second academic semester (2023–2024).
- **Human Boundaries**: Employees in the Greater Amman Municipality.

- **Thematic Boundaries**: Within the Greater Amman Municipality, the study concentrates on examining the literature pertaining to transformational leadership and its various dimensions, including inspirational motivation, intellectual stimulation, individual consideration, and idealized influence (charisma), in connection to job satisfaction.

2 Previous Studies

In a study conducted by Muharam [10] titled "The Impact of Transformational Leadership on Employee Satisfaction," the objective was to explore the correlation between transformational leadership style and employee satisfaction. The research employed a quantitative approach, utilizing descriptive analysis and verification methods within an explanatory research framework. Purposive sampling techniques were used to select a sample of 32 participants. Data analysis was conducted using the EViews v12 software. The findings of the study revealed that changes in transformational leadership style can explain and predict employee satisfaction, indicating a unidirectional relationship. Furthermore, the study identified a predictive association between the variables under investigation.

In a recent study conducted by Chen et al. [8] titled "Transformational Leadership and Employee Job Satisfaction: The Mediating Role of Employee Relationship Climate and the Moderating Role of Gender," the objective was to examine the intricate connection between transformational leadership and employee job satisfaction. The study specifically focused on the mediating role of employee relationship climate and the moderating effect of gender. To gather and analyze data, a comprehensive survey was administered to 211 public employees. The findings revealed a positive correlation between transformational leadership and employee job satisfaction, with employee relationship climate serving as a crucial mediator in this relationship.

3 Methodology and Procedures of the Study

3.1 Methodology of the Study

This research employs a descriptive-analytical methodology to understand the pattern of transformational leadership within the Greater Amman Municipality.

Table 1 Reliability statistics of the study instrument

Metric	Value
Number of questionnaire items	28
Total sample size	389
Number of complete questionnaires	388
Percentage of complete questionnaires	97.7%
Mean of the total scale	104.94
Standard deviation of the total scale	13.353
Variance of the total scale	178.314
Cronbach's alpha coefficient	0.976

3.2 Study Population

The focus of this study is on the employees of the Greater Amman Municipality. The study population is made up of individuals with diverse characteristics, including age, gender, educational background, job position, and length of service within the municipality.

3.3 Study Sample

In order to establish the appropriate sample size for this particular study, the table was utilized. This table offers suggested sample sizes for different population sizes, ensuring that a representative sample is obtained. As displayed in Tables 1, 2 and 3, a study population of 9000 would require a sample size of 368. To achieve the highest possible response rate, the questionnaire was distributed through Google Forms, as outlined in Appendix 1. Employing a method of simple random sampling, a total of 389 questionnaires were distributed, with 388 successfully retrieved and deemed suitable for statistical analysis. The response rate surpassed the recommended threshold.

Using this methodology to determine the sample size, the study shows a strong commitment toward attaining a very high level of statistical validity when investigating the impact of transformational leadership on job satisfaction within the Greater Amman Municipality.

3.4 Measurement Scale

To assess the questionnaire items in the study, a Likert scale with five points was utilized. This scale encompasses Strongly Agree (5 points), Agree (4 points), Neutral (3 points), Disagree (2 points), and Strongly Disagree (1 point).

Table 2 Reliability statistics of the study instrument—Cronbach's alpha value when any item is removed

Item	Mean of the scale	Variance of the scale	Corrected correlation	Cronbach's alpha coefficient
Enhances team spirit	100.91	632.493	0.765	0.976
Provides a compelling vision for the future	101.05	628.008	0.832	0.976
Expresses confidence in achieving organizational goals	100.99	634.641	0.781	0.976
Takes corrective action when expectations are not met	101.09	632.125	0.753	0.976
Motivates me to think about problems in new ways	101.07	631.067	0.784	0.976
Encourages me to explore different solutions to problems	101.08	633.869	0.784	0.976
Inspires creativity, thinking, and innovation	101.15	626.734	0.800	0.976
Promotes a culture of learning and development	101.10	630.204	0.778	0.976
Takes time to listen to my concerns and needs	101.14	630.580	0.742	0.976
Provides constructive feedback on my performance	101.14	627.250	0.841	0.976
Helps me develop my strengths and improve my weaknesses	101.18	627.385	0.810	0.976

(continued)

Table 2 (continued)

Item	Mean of the scale	Variance of the scale	Corrected correlation	Cronbach's alpha coefficient
Allocates development opportunities based on individual needs	101.28	627.745	0.788	0.976
Clarifies the values and principles I wish to adhere to	101.11	631.273	0.787	0.976
Respected and admired by the work team	101.02	631.514	0.775	0.976
Provides a role model through behavior	100.99	632.139	0.784	0.976
Shows consistency between words and actions	101.14	626.291	0.829	0.976
Satisfied with the salary I receive	101.45	631.334	0.683	0.976
Feels fully qualified for the job	101.06	630.598	0.794	0.976
Feels there is a very good opportunity for promotion	101.39	627.091	0.734	0.976
Satisfied with the benefits I receive	101.45	625.437	0.760	0.976
Feels I receive the recognition I deserve for good work	101.34	622.136	0.813	0.976
Many of our rules and procedures make doing the job well easy	101.42	625.386	0.790	0.976
Likes the people I work with	101.01	640.509	0.668	0.976
Feels the job is highly meaningful	100.95	640.023	0.663	0.976

(continued)

Table 2 (continued)

Item	Mean of the scale	Variance of the scale	Corrected correlation	Cronbach's alpha coefficient
Feels communication channels are good within Greater Amman Municipality	101.27	629.396	0.733	0.976
Satisfied with the value and timing of increases I receive	101.68	626.571	0.695	0.976
Feels those who do good work have a fair chance for promotion	101.64	625.328	0.729	0.976
Feels that my supervisor is fair in dealing with me	101.18	626.843	0.819	0.976

Table 3 Cronbach's alpha coefficient for dimensions of the study instrument

Variable	Number of items	Dimension	Cronbach's alpha coefficient
Transformational leadership	4	Inspirational motivation	0.908
	4	Intellectual stimulation	0.924
	4	Individual consideration	0.914
	4	Idealized influence	0.931
	16	Transformational leadership (overall)	0.947
Job satisfaction	12	Job satisfaction (overall)	0.950

3.5 Multifactor Leadership Questionnaire (MLQ)

The Multifactor Leadership Questionnaire (MLQ) was used to measure the dimensions of transformational leadership.

3.6 Job Satisfaction Survey (JSS)

The concept of job satisfaction is complex; it has many dimensions. It acts as a barometer reflecting the employees' total feelings about the job and work conditions.

It is generally agreed that many things lead to that feeling, including job content itself, relationships with colleagues and bosses, professional development opportunities, and also being able to have a work-life balance, plus compensation plus benefits.

3.7 Validity and Reliability of the Instrument

Face Validity

The questionnaire's face validity, which ensures that it accurately measures its intended purpose, was confirmed through a process of presentation and feedback. To assess face validity, the researchers sought the input of nine experts in management and statistics. Taking into account the experts' suggestions, the researchers made the appropriate revisions and adjustments to the questionnaire.

Reliability

Consistency is a fundamental aspect of reliability in questionnaires, ensuring that if the same questionnaire is administered multiple times under identical circumstances, it will produce consistent or comparable results. To evaluate the reliability of the questionnaire, the researchers employed Cronbach's Alpha Coefficient in a reliability analysis. This analysis encompassed all 28 items of the questionnaire and was conducted with 388 valid responses, out of the 389 questionnaires that were distributed.

Taking this into account, the researchers determine that the questionnaire used in the study demonstrates a significant level of reliability and internal consistency across its various items.

Table 2 provides an analysis that delves into the reliability of the study instrument, particularly exploring the influence of excluding specific items from the questionnaire on the Cronbach's alpha coefficient.

The internal consistency within each dimension of transformational leadership, which encompasses Inspirational Motivation, Intellectual Stimulation, Individual Consideration, and Idealized Influence, is demonstrated by the Cronbach's Alpha coefficients ranging from 0.908 to 0.931. These coefficients indicate excellent reliability. Furthermore, the overall reliability coefficient for the entire transformational leadership construct, measured across all 16 items, is 0.947, affirming a high level of consistency for this scale. Similarly, the dimension of job satisfaction exhibits exceptional internal consistency, as indicated by a reliability coefficient of 0.950 across the 12 items that were measured.

Reliability analysis utilizing Cronbach's Alpha provides insight into the internal consistency of scales. Generally, Cronbach's Alpha values higher than 0.7 are deemed acceptable, while values surpassing 0.9 indicate exceptional reliability. In this study, both the transformational leadership and job satisfaction scales exhibit outstanding internal reliability, as evidenced by the Cronbach's Alpha analysis. This level of

reliability underscores the well-constructed nature of the instrument and its suitability for accurately measuring the constructs of interest in the present investigation.

3.8 Correlation Matrix Between Study Variables (Pearson Correlation Coefficient)

To evaluate the level of variability between the study variables and establish internal construct validity, the Pearson correlation coefficient was computed. This analysis aimed to identify any significant linear correlations (multicollinearity) among the different dimensions of the independent variable. The outcomes of this analysis can be found in Tables 3 and 4.

Based on the data presented in Table 4, it is evident that there are no signs of multicollinearity among the variables examined in the study. Typically, correlations exceeding 0.80 would suggest a potential concern, but in this case, it can be confidently stated that the sample does not display any significant problems associated with high multicollinearity (Table 5).

Table 4 Correlation matrix between variables

Number	Dimension	Transformational leadership	Job satisfaction
1	Transformational leadership	1	
2	Job satisfaction	0.572	1

Table 5 Criteria for judging means

Rating	Level of significance
1 to 2.33	Low
2.34 to 3.67	Medium
3.68 and above	High

4 Results

4.1 Overall Levels of Transformational Leadership Dimensions

By conducting calculations, the researchers determined the means and standard deviations for the four dimensions of transformational leadership that were examined. Table 6 offers a comprehensive summary of the means, standard deviations, levels, and overall rankings for each dimension, namely Inspirational Motivation, Intellectual Stimulation, Individual Consideration, and Idealized Influence (Charisma).

The range of scores for these dimensions falls between (3.75) and (3.948), demonstrating a significant level of consensus among the participants in all aspects. Notably, Inspirational Motivation emerges as the dimension with the highest mean score of (3.948), solidifying its position at the top. This finding underscores the strong agreement within the study sample regarding the presence of inspirational motivation in their leadership.

Coming in at second place with a mean score of (3.835), we have Intellectual Stimulation, which signifies a strong consensus on the leader's ability to foster creative and innovative thinking. Ranked third with a mean score of (3.87) is Idealized Influence (Charisma), indicating that the leader is seen as a charismatic role model who sets a positive example and garners respect and admiration from the team.

With a mean score of (3.75), Individual Consideration secured the fourth position, indicating a strong consensus regarding the leader's commitment to addressing individual needs and interests. Although it received the lowest score, it still demonstrates a significant level of agreement.

Based on the study sample, it is evident that there is a high level of consensus regarding the presence of transformational leadership dimensions in their leadership, as indicated by an overall mean of 3.85 for this dimension.

Table 6 Descriptive statistics, levels, and overall ranks for transformational leadership dimensions

No.	Dimension	Mean	Level	Rank
1	Inspirational motivation	3.94	High	1
2	Intellectual stimulation	3.83	High	2
3	Individual consideration	3.75	High	4
4	Idealized influence (Charisma)	3.87	High	3
Overall mean for transformational leadership		3.85	High	

4.2 Job Satisfaction Level

The dimensions of job satisfaction are summarized in Table 7, which provides information on the means, standard deviations, levels, and ranks. The average levels of agreement for these dimensions range from average to high, with mean scores falling between (3.26) and (3.99).

Among the items assessed, the statement "I feel that my job is very meaningful" garnered the highest mean score of (3.99), with a standard deviation of (1.060). This

Table 7 Descriptive statistics, levels, and ranks for job satisfaction dimension

No.	Statement	Mean	Standard deviation	Level	Rank
1	I am satisfied with the salary I receive	3.48	1.275	Average	9
2	I feel that my leader is fully qualified for their job	3.87	1.125	High	3
3	I feel that there is a very good chance for promotion in my job	3.55	1.304	Average	7
4	I am satisfied with the benefits I receive in my job	3.48	1.305	Average	10
5	I feel I receive the recognition I should for doing good work	3.60	1.303	Average	6
6	Many of our rules and procedures make doing the job well easy	3.52	1.258	Average	8
7	I like the people I work with	3.93	1.039	High	2
8	I feel that my job is very meaningful	3.99	1.060	High	1
9	I feel that communication channels are good within the Greater Amman Municipality	3.67	1.245	Average	5
10	I feel satisfied with the value and timing of the raises I receive	3.26	1.385	Average	12
11	I feel that those who do good work have a fair chance for promotion	3.30	1.360	Average	11
12	I feel that my leader is fair in dealing with me	3.76	1.182	High	4
Overall mean for job satisfaction		**3.617**		**Average**	

highlights the fact that the participants in the study strongly agreed with the notion that their jobs hold significant meaning. Consequently, this finding suggests a notable level of job satisfaction in relation to this particular aspect.

On the other hand, the statement that received the lowest average rating is "I feel satisfied with the value and timing of the raises I receive," scoring an average of 3.26 and a standard deviation of 1.385, placing it twelfth in rank. This implies a moderate level of consensus on this aspect, implying that there is potential for enhancement in terms of job satisfaction in this particular area.

The statements "I like the people I work with," and "I feel that my leader is fully qualified for their job" garnered impressive average scores of 3.93 and 3.87, respectively, securing the second and third spots. This underscores the significance of interpersonal connections and effective leadership in fostering job contentment.

The study sample demonstrates a moderate level of job satisfaction, as indicated by the mean score of (3.617) for the job satisfaction dimension.

4.3 Discussion of Results

In this section, the researchers discuss the main findings of the current study, comparing these results with previous studies. The discussion includes:

1. In the Greater Amman Municipality, the implementation of transformational leadership was found to be at a high level, according to the current study. The highest-ranked dimension was Inspirational Motivation, with a score of 3.94, closely followed by Intellectual Stimulation (3.83), Idealized Influence (3.87), and Individual Consideration (3.75). These findings are consistent with a previous study conducted on transformational leadership in Jordanian commercial banks, which also reported a high level of transformational leadership at 3.96. Therefore, the current study's results support and reinforce the findings of their earlier research.
2. The level of job satisfaction observed in the Greater Amman Municipality is moderate, as indicated by the results. This aligns with the findings of Al-Tuwaijri [7] and the study conducted, both of which also reported a moderate level of job satisfaction. However, this contrasts with the findings of [2], where job satisfaction was reported as high. Furthermore, it differs from the study conducted in the private health sector in Saudi Arabia, which found high levels of job satisfaction among employees. These results are consistent with the study conducted, which reported a moderate level of job satisfaction among social security employees.
3. The results of the present investigation indicate that employee satisfaction within the Greater Amman Municipality is significantly influenced by transformational leadership, accounting for a substantial portion (69.7%) of the variation in job satisfaction. This discovery is consistent with previous research, including a study conducted [2], which observed a strong impact of transformational leadership on job satisfaction in a similar community. Additionally, the findings align with

the work of, who established a significant positive correlation between transformational leadership and employee engagement within the Greater Amman Municipality. These collective findings further support the notion that qualities associated with transformational leadership, such as inspiration and individual consideration, play a critical role in fostering positive employee attitudes within the public sector in Jordan.

4.4 Recommendations

Based on the previous results, the study recommends the following:

- To achieve a more comprehensive understanding of the correlation between transformational leadership and employee satisfaction in diverse contexts, future research should expand its focus to encompass a wide range of organizations, sectors, and regions. By doing so, the findings will become more applicable to different settings and enhance their overall generalizability.
- To enhance the statistical power and dependability of the study findings, researchers are advised to employ larger sample sizes. This approach would not only facilitate a more comprehensive examination of subgroups but also bolster the overall reliability of the analysis.
- In order to address potential biases that may arise from using research tools like questionnaires, it is recommended that future studies incorporate a variety of data sources, such as evaluations from supervisors, assessments from peers, or objective performance indicators, in order to validate the findings.

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Blockchain-Enabled Solar Energy Trading: Enhancing Efficiency and Transparency



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Abstract The adoption of solar energy is crucial for sustainable development and combating climate change. Traditional energy trading systems are hindered by centralization, lack of transparency, and high transaction costs. Blockchain technology provides a decentralized, secure, and transparent solution to these issues. This paper explores the application of blockchain in solar energy trading, focusing on its potential to enhance market efficiency and transparency. We review current research on blockchain-based energy trading, emphasizing benefits such as cost reduction and increased efficiency through peer-to-peer (P2P) trading and smart contracts. A case study demonstrates the practical implementation of a blockchain-based solar energy trading system, highlighting improvements in efficiency, security, and user satisfaction. Despite its promise, challenges like scalability, regulatory issues, and stakeholder acceptance persist. Future research directions are suggested to address these challenges.

Keywords Blockchain · Solar energy · Energy trading · Peer-to-peer trading · Renewable energy certificates · Smart grids · Technological progress

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1 Introduction

The need to switch to renewable sources of energy is therefore very critical in a globally changing climate and sustainable development. Among many renewable resources, solar energy shows prominence with abundance and renewability, and thus remains one of the main drivers in the world towards a cleaner source of energy. However, existing energy trading systems have posed important barriers to the optimal use of solar power. Traditional systems often reflect features of centralization, non-transparency, and inefficiency, resulting in high transaction costs and low utilization of potential solar energy resources.

Blockchain technology has evolved as a panacea of sorts for such problems, offering a decentralized, transparent framework in which energy can be traded. Enabling peer-to-peer transactions between producer and consumer, blockchain can significantly decrease reliance on middlemen, thereby considerably reducing transaction costs and raising efficiency. Moreover, transaction automation inherent in smart contracts within the platform makes sure that operations will be secure, transparent, and tamper-proof. This technological innovation will lead to a much more efficient and hence fair energy market in which producers and consumers can directly engage in peer-to-peer energy trading.

The role of blockchain technology in solar energy trading is assessed in this paper. Second, it surveys the literature available on blockchain-based energy trading systems and subsequently outlines the advantages of decentralization, transparency, and efficiency inbuilt into the blockchain over traditional ones. A detailed case study of a blockchain-based solar energy trading platform, its detailed design, implementation, and some performance metrics, is presented. This gives practical insight into the real-world application of blockchain technology in solar energy markets.

Still, a very long and arduous road remains to fully realize the potential of blockchain for energy trading, which is strained by scalability issues, regulatory barriers, and reaching stakeholder acceptance and collaboration. In this sense, an attempt has been made to outline the challenges and indicate possible solutions and future research directions. By meeting these challenges, blockchain technology can contribute fundamentally to the improvement in efficiency and large diffusion of solar energy. This paper thus adds to the understanding and development of blockchain-enabled energy trading systems on the pathway to a sustainable energy future, in which solar power will come into its own.

2 Background

The need to transit toward renewable energy sources is one of the ways to fight global climate change and achieve sustainable development. Among them, solar energy stands out due to its abundance and renewability. Therefore, it would become one of the main driving forces in the global shift toward cleaner energy [1]. However,

there exist very challenging issues for the optimal exploitation of solar power arising from existing trading systems for energy [2]. These traditional systems are mostly centralized, opaque and inefficient with high transaction costs and underutilization of the solar energy resources available.

Solar Energy Trading

Solar energy trading refers to the act of selling and buying electricity generated by solar energy producers, such as households, to consumers. Traditional energy trading systems normally involve central coordination by utilities and other regulatory bodies. They generally come with the following issues:

Inefficiency: Centralized systems are slow because they include bureaucratic procedures involving several layers of verification and approval. This could delay transaction processing and energy distribution [3–5].

High Transaction Costs: It costs arise due to services rendered by third parties, such as utility companies and brokers. This raises the total trading cost of energy. These costs often make participation in energy markets very difficult for small producers and consumers [6].

Lack of transparency: Traditional systems most of the time lack transparency, whereby participants cannot verify transactions and trace back to their origin and energy flow. This may result in issues related to trust and possible disputes between parties [7].

Security Vulnerabilities: Centralized databases have become ever more a prized target of cyber-attacks. One successful attack could compromise relevant sensitive data and bring disruptions in energy distribution—of huge potential consequences to the economy and society.

Intersection of Blockchain and Solar Energy Trading

Many of the limitations of conventional systems could be overcome by the integration of blockchain technology into solar energy trading [1]. Key benefits include:

Decentralized Energy Trading: Blockchain empowers decentralized energy trading platforms between peers, which in turn makes it possible for any person to sell energy to and buy it from anyone [8]. After that, intermediation is reduced, along with transaction costs, enhancing market efficiency. Consumers are put at the core of activity in decentralized trading, able to become "prosumers" in the production and consumption of energy for a more decentralized and resilient energy grid [2].

Automated Transaction: Smart contracts automate energy transactions. For instance, a smart contract will execute a transaction when a house is generating excess solar energy and another house needs extra energy. This type of automation of transactions assures that transactions are timely and accurate, reducing the chances of errors and disputes [3]

Security Enhanced: This decentralized and immutable nature of blockchain enhances the security count of energy trading systems. Since every transaction is recorded in multiple nodes, this reduces the risk of data breaches and cyber-attacks

to a large extent. Apart from that, transparency through a blockchain ledger makes fraudulent activities traceable and more difficult to perpetrate [4].

Real-Time Settlement: Blockchain empowers real-time energy transaction settlement. Traditional systems often have delays in their payment processing and settlement. In contrast, blockchain can settle transactions instantaneously, thereby improving cash flows and reducing financial risks to the parties concerned.

3 Literature Review

Several pilot projects and platforms have been developed that are testing blockchain-based local energy trading in the solar energy sector [5]. These pilots show that blockchain technology can be put into practice within the energy sector, offering added value [3].

Brooklyn Microgrid

Probably one of the first pilot examples of blockchain-based peer-to-peer solar energy trading is the Brooklyn Microgrid project in New York. Every resident within this initiative who has installed solar panels can resell excess energy to neighbors using a blockchain platform [3]. The main features of the Brooklyn Microgrid are the following:

Decentralized Energy Exchange: This directly connects participants so that residents can sell energy to other residents, circumventing the traditional utility companies and creating an entire local energy market much more efficient and resilient [4].

Real-Time Data Tracking: The blockchain platform shows real-time data on energy production and consumption. This provides a real-time awareness of the quantity of energy used or traded by participants of the community, thereby improving transparency and trust [5].

Smart Contracts: Smart contracts automate energy transactions based on predefined conditions set out in the transaction. This aids accurate and timely settlements, reducing the administrative burden and minimizing the risk of disputes.

Grid+

Grid+ is a project by ConsenSys aimed at developing a blockchain-based energy market [3]. The platform enables customers to have better control of their consumption and its associated costs. Some of the primary characteristics of Grid+ include:

Smart Energy Agents: Grid+ utilizes smart energy agents that handle energy transactions on behalf of the customer. These agents automatically purchase and sell energy in a real-time marketplace to achieve optimal energy usage and cost.

Blockchain Ledger: All transactions are irrevocably noted on a blockchain ledger, which makes everything transparent and secure. Consumers can trace their energy usage and trading activities in real time [5].

Integration of Renewable Energy Sources: Grid+ supports the integration of renewable energy sources like solar and wind. This helps on the use of clean energy and contributes to a much more sustainable energy market.

Real-Time Settlement: Blockchain empowers real-time energy transaction settlement. Traditional systems often have delays in their payment processing and settlement. In contrast, blockchain can settle transactions instantaneously, thereby improving cash flows and reducing financial risks to the parties concerned.

4 Methodology

The methodology will be followed in this research while evaluating the possible benefits that blockchain technology can bring into the trading of solar energy, challenges to be encountered, and practical implementations.

Potential Benefits of Blockchain in Solar Energy Trading

Decentralization and Democratization: Blockchain opens up decentralized energy markets and reduces traditional power companies dominance over the energy market, putting consumers and small producers at the wheel. This democratization of the energy market could mean more competitive prices and higher participation in renewable energy production [5].

Higher Efficiency in Markets: Blockchain reduces transaction costs by cutting out intermediaries and automating transactions through smart contracts. This can lead to a decrease in energy prices for the consumer and an increase in the revenue of producers [6].

Improved Security and Resilience: This reduces the risk of having a single point of failure within the system, hence making it very hard to have effective cyber-attacks against a blockchain-based system. Moreover, blockchain records cannot be changed. Thus, once they are written, it is irrevocable, allowing integrity, reliability, and consistency in transaction data [7].

Improved Transparency and Trust: It provides a transparent, immutable record of every single transaction that gives improved trust amongst the parties. Consumers can trace back to the source and energy flow, while producers are able to prove origin and sustainability of their energy production.

Renewable Energy Integration: Blockchain will support the integration of renewable energy through effectiveness and transparency in trading energy, thereby possibly promoting the use of clean energy and contributing to more sustainable energy markets [8].

5 Implementation of Smart Contracts

In this work, implementation will be done by deploying and testing contracts on the blockchain network using Hardhat. The target of the testing process is to prove the performance of smart contracts in regard to different sets of cases, providing data integrity, security, and automatization of processes.

Testing with Hardhat:

Test case	Description	Expected outcome	Actual outcome	Status
Deploy contract	Deploy the smart contract to the Sepolia network	Contract is deployed	Contract is deployed	Pass
Data integrity	Verify the integrity of the data	Data matches	Data matches	Pass
Unauthorised access attempt	Attempt unauthorised access to the data	Access is denied	Access is denied	Pass
Automated resource allocation	Test resource allocation via smart contract	Resources allocated	Resources allocated	Pass

Smart Contract Development: Develop smart contracts in Solidity, specifying the rules concerning data management, access control, and resource allocation. The contracts are designed to handle tasks like energy transactions and automated processes [9].

Deployment: Finally, deploy these smart contracts on the Sepolia Network with Hardhat. Hardhat provides an efficient environment for contract deployment and testing.

```
eth_getTransactionByHash
eth_getBlockByNumber
eth_getTransactionReceipt


  Transaction:          0x3f2f3fa6b178d57c410e9160898eef895ebcab75dc66db6de926b1ef5a26457d
  From:                 0xf39fd6e51aad88f6f4ce6ab8827279cfffb92266
  Value:                1. gwei
  Gas used:             445304 of 445304
  Block #1:             0x3b6a9fbba134f90d44ae9c129930256f44a9330244d1b97119acb5f25091ac20

eth_getTransactionByHash
eth_getBlockByNumber
eth_getTransactionReceipt

  From:                 0xf39fd6e51aad88f6f4ce6ab8827279cfffb92266
  Value:                1. gwei
  Gas used:             445304 of 445304
  Block #1:             0x3b6a9fbba134f90d44ae9c129930256f44a9330244d1b97119acb5f25091ac20

eth_getTransactionByHash
eth_getBlockByNumber
eth_getTransactionReceipt
  Gas used:             445304 of 445304
  Block #1:             0x3b6a9fbba134f90d44ae9c129930256f44a9330244d1b97119acb5f25091ac20

eth_getTransactionByHash
eth_getBlockByNumber
```

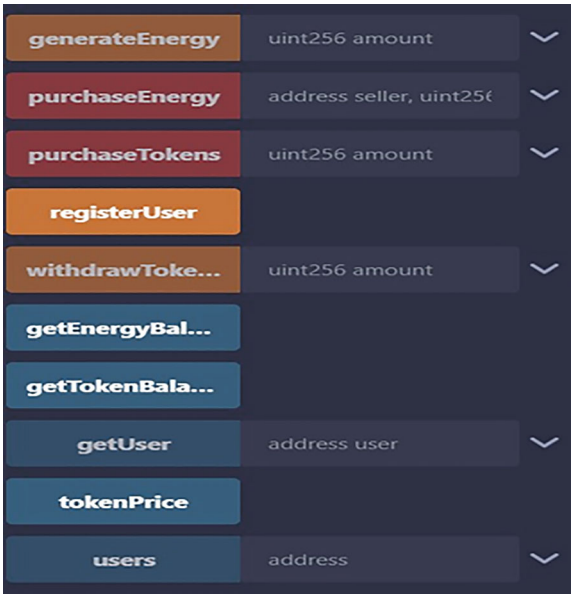
Testing: Thorough testing of smart contracts ensures functionality and security. Some of the tests conducted are as follows:

Deployment Validation: Verify that the contract has been properly deployed into the blockchain and is accessible.

Data Integrity Checks: Verify that data managed by the Contract is accurate and consistent.

Security Testing: Verify Unauthorized access is duly restricted.

Resource Allocation Testing: Validate that resources are allocated correctly as per the rules followed by the contract.



Results: All test cases passed. This demonstrates that the smart contracts functioned as intended, were successfully deployed, data was managed correctly, secure access controls were in place, and automated resource allocation worked effectively.

Challenges and Future Directions

Notwithstanding the potential advantages, the adoption of blockchain in solar energy trading is also faced with a few challenges:

Regulatory and legal issues: Most of the regulations might not be designed for such a decentralized system, so there will be ambiguities regarding the legal status of blockchain transactions. Policymakers should work out a framework that will facilitate innovative growth without sacrificing consumer protection and market stability [10].

Scalability: Blockchain networks can become prone to scalability issues, especially considering large transaction volumes. Solutions like sharding, off-chain transactions, and improved consensus algorithms are in the development stage to address challenges caused by these issues. Further research in this line of thinking should be directed toward enhancing scalability and developing blockchain systems with better performance for large-scale energy trading.

System Integration: Blockchain would like to integrate with pre-existing energy infrastructure [11]. That requires coordination among different actors, from energy producers to consumers, utilities, and regulators. An avenue to easier integration and better interoperability between blockchain-based and traditional energy systems would therefore be through the development of standardized protocols and interfaces [12].

Energy Consumption: The energy consumption for blockchain networks, mostly proof-of-work consensus mechanisms, might be high. Therefore, research in more energy-efficient consensus mechanisms, like proof-of-stake, may help resolve the situation [13].

6 Results and Discussion

Testing was performed on various test cases in order to learn how blockchain technology has performed in the trading of solar energy. These include a test case for the deployment of smart contracts, data integrity verification processes, unauthorized access attempts tests, and automation of resource allocation. Deployment and testing of smart contracts successfully give evidence to its feasibility and benefits in using blockchain technology in solar energy trading. By being able to work directly between peers, blockchain enables peer-to-peer energy trading that reduces the dependency on traditional utility companies and intermediaries in the exchange. This could result in a much more competitive pricing process, one that includes more market participation from small-scale producers and consumers [14].

Because it is peer-to-peer trading, much of the transaction costs are removed. Besides, smart contracts allow for automated transactions, thus streamlining processes in order to ensure timely settlements, which in turn provides better market efficiency and likely brings down energy prices to consumers while leading to higher revenues on the producer side. Because the blockchain is transparent, all participants are allowed to check, verify, and illustrate flows of energy in near real-time. This feature creates trust among the participants and reduces the possibilities of disputes, as observed from test cases with data integrity maintained [15].

7 Conclusion

Blockchain technology can become a strong force of transformation for the trading of solar energy: it will bring about a new way of managing and optimizing energy transactions. The intrinsic features of blockchain—decentralization, transparency, and security—fit quite well in the attainment of objectives for fashioning an energy market that is efficient and fair. Under blockchain, it is possible to shift solar energy trading from traditional centralized systems into a more decentralized one, hence reducing dependence on intermediaries and reducing costs resulting from transactions. It also empowers both the consumer and the producer through P2P trading, making a more resilient and competitive energy market.

Applications of blockchain in solar energy trading enhance weaknesses of traditional systems on several grounds. It enhances transparency by virtue of the immutable ledger of transactions, thereby increasing trust between participants and reducing disputes. Smart contracts are encoded to automate transaction processes,

further reducing administrative overhead and hence minimizing errors. In addition, the decentralized nature of blockchain removes the single point of failure, making the trading system much more secure and resilient. Despite all of the advantages, a number of challenges still persist. First of all, for decentralized energy trading systems, it will require adaptation on the regulatory and legal fronts. With this in mind, scalability issues will have to be resolved in order to handle huge transaction volumes. More importantly, blockchain integration with existing energy infrastructure will have to be suitably coordinated among various stakeholders and standardized protocols developed. More than that, blockchain networks'—in particular, proof-of-work mechanisms—energy consumption itself also warrants exploring more energy-efficient consensus algorithms.

It is easy to envision that blockchain technology, as a facet of solar energy trading, will surge immensely in importance with evolving blockchain technology and changing regulatory environments. Indeed, the potential benefits in reduced transaction costs, improved security, and enhanced market efficiency all tend to explain the pivotal role blockchain may play in the future of the sustainable energy markets. More precisely, for the full realization of the potential of blockchain, ongoing research and development will be vital to overcome current challenges and to enable this technology to promote the global transition to renewable energy.

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The Ethics of AI in Education: A Psychological Perspective on Bias and Fairness



Adnan Hassan Alsarayreh

Abstract The growing incorporation of Artificial Intelligence in educational systems elicits weighty ethical considerations on bias and fairness. This chapterlooks into the psychological implications of the use of AI in education with a specific focus on bias and unfairness throughout the design and implementation of AI technology. The study is a research synthesis that takes a qualitative approach to reviewing available literature on the topic, including its socio-economic and cognitive impacts on students. An analytical perspective provided by the study helps identify thematic concerns and challenges related to AI-driven educational tools, underlining the need for deliberate and ethical considerations during development. The findings stress that issues concerning ethics need to be responded to proactively so that inequities within education are not perpetuated. In broader terms, it provides a basis for well-informed discussions along with recommendations toward attaining fairness in AI applications within educational settings.

Keywords Artificial intelligence · Education · Ethics · Bias · Fairness · Cognitive development · Psychological impact · Socio-economic implications · Qualitative research · Educational technology

1 Introduction

Ethical considerations regarding the application of artificial intelligence (AI) in education emerge at the crossroads of technology and education; however, during the conception, design, and implementation of these systems, moral aspects are

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frequently neglected. This oversight can result in the use of technology that perpetuates bias, inequity, and unfairness [1]. Consequently, it is essential to follow established ethical standards grounded in fundamental principles and policies to intentionally and proactively pursue fairness, inclusion, and potential within educational technology. In this context, the significance of conception and design is highlighted, yet these same concerns should hold equal weight during the implementation of such systems. Moreover, a broader lack of awareness concerning emerging ethical dilemmas can result in a naïve and uncritical application of technologies that may produce unintended and adverse effects [1]. Thus, it is imperative to urgently recognize and address any ethical issues that arise in educational environments related to the implementation of technology like AI. Within this paper, it is critical to consider breaking down bias and fairness concepts and challenges within the spheres of education and social justice, especially in the fine balance of design and execution. The dynamics of how equity is introduced in an educational setting have been a bone of contention alongside its implications and challenges on socio-economic terms. This analysis is drawn from qualitative interviews with professionals working in education—school leaders and teachers—thus underscoring how their perceptions could inform the development as well as practical application of educational technologies which are informed by AI, machine learning, big data [2]. More specifically, the probe has revolved around how biases' and unfairness' existence is known or accepted into data use. Ultimately, it has been posited that to achieve fairness, AI and its associated systems and solutions must approach the parameters of fairness with greater deliberation, awareness, and caution right from the beginning.

1.1 Background and Rationale

The growing interest in the ethics surrounding AI use in education stems from the increasing implementation of various AI systems, including intelligent tutoring systems, learning analytics, and recommender systems. While the application of AI in educational contexts presents promising opportunities, it also carries inherent risks, making it essential to focus on the ethical implications. Research addressing the ethical dimensions of AI's impact on education has been limited thus far. It is important to determine whether the ethical concerns identified by educational stakeholders align with those recognized by the AI community. For educational actors to voice their concerns effectively or act upon promoting ethical AI, they must first be made aware of potential ethical issues. The influence that educational AI systems have on the life opportunities of students makes it a necessary condition for any critique to go beyond technical characteristics like accuracy and reliability, including ethical aspects in the design and use of them. Various guidelines and recommendations have put forward several principles concerning the ethics related to the design and use of AI. In this regard, this chapter critically examines those ethical issues these principles seek to address in terms of their significance and applicability within an area focused on education. The general adoption of AI-supported educational technology offers

an opportunity to improve both quality as well as access to education; however, it also poses risks that threaten fundamental values such as fairness. This is because such technology often bases its functioning on data relating to students' backgrounds regarding different aspects—including socio-economic information and past performance—used to predict future outcomes—hence risking fairness. Such systems may explicitly or implicitly favor certain individuals, particularly those with a robust socio-economic status, while disadvantaging others. It is alarming that current educational technology struggles to manage these risks. Efforts are underway to educate various stakeholders about the potential implications of AI in education and to advocate for justice and equity in the design and application of AI within educational settings. Nevertheless, nearly all initiatives stem from commercial, governmental, or research sectors, leaving schools, educators, and students either reliant on the initiatives of others or unable to directly tackle issues of fairness. A framework designed to establish fairness that societal actors can engage with concerning data-driven AI within the contexts of postmodern educational governance in Sweden. This framework has been crafted through:

1. Ethical and philosophical reflections on fairness related to data management in AI
2. An examination of the ways fairness is addressed in educational governance policies, and
3. An investigation into how educational equality and justice are treated within Swedish educational governance contexts.

1.2 Scope and Objectives

This chapter, as suggested by its title, explores the ethical dilemmas associated with the growing implementation of AI constellations in education, while also incorporating a psychological viewpoint on issues of bias and fairness. The focus is on educational policy documents from Sweden [3]. The scope is somewhat restricted to the nature and extent of educational activities (formal, compulsory schooling) and AI constellations (algorithms that aid decision-making in national assessments and cognitive tutoring). Instead of merely addressing the construction of systems and algorithms, this discussion emphasizes the ethical implications of AI constellations. A significant emphasis is placed on the concept of fairness, which is pivotal to the AI constellation. The exploration of fairness issues is approached from a psychological angle, concentrating on two main inquiries: what challenges related to bias and fairness do the AI systems involved in formal education present? How are these bias and fairness concerns represented in pertinent policy documents? Most media coverage regarding the societal effects of AI has primarily focused on generative systems such as ChatGPT [4]. In this study, algorithms with a narrower focus, investigated within a Swedish framework, have been utilized for an extended period and significantly influence educational choices impacting many people. Both the EU and Sweden

have adopted a regulatory stance toward perceived or actual risks and threats, which encompass biases related to socioeconomic status and ethnicity [4].

1.3 Methodology

This chapter takes a qualitative approach to explore the ethical dimensions of artificial intelligence in educational contexts, specifically psychological impacts concerning bias and fairness. In so doing, the study shall adopt a descriptive methodology in reviewing existing literature both theoretical frameworks and empirical studies with an aim to identify prevalent themes and issues related to bias and fairness in artificial intelligence systems regarding students' cognitive as well as emotional well-being. An analytical approach will then be applied toward synthesizing these findings, thereby drawing out possible insights into how AI-driven educational tools might perpetuate or mitigate biases developed by such tools and how these biases affect students in their educational experiences and outcomes. The fusion of descriptive and analytic techniques is intended to give a full understanding of the ethical challenges that AI will bring in its train in education so that there can be discussions based on evidence and recommendations for fairness in the application of artificial intelligence.

2 Understanding AI in Education

AI technologies are being progressively integrated into educational settings to tailor both learning and teaching experiences. These systems mimic human cognitive abilities and adjust responsively to the requirements of learners. Intelligent tutoring systems, which fall under the category of AI, assess learners' knowledge and facilitate their education. Utilizing the BKT framework, educational AI systems provide numerous advantages, allowing for personalized education that is cost-effective, rapid, and rich in data [5, 6].

2.1 Definition and Types of AI in Education

Artificial Intelligence (AI) refers to a computer system that can replicate cognitive abilities typically associated with human thought processes, such as perception, reasoning, learning, and knowledge acquisition. These intelligent machines may surpass human capabilities, giving rise to significant ethical dilemmas within society. The EU High-Level Expert Group on AI recommends that AI systems adhere to principles of legality, ethics, and robustness, emphasizing human agency, technical safety and robustness, privacy and data governance, transparency, fairness and non-discrimination, societal and environmental welfare, and accountability [5]. In the

realm of education, AI systems have the potential to assist both teachers and students by analyzing individual preferences and needs, creating personalized learning paths, facilitating routine tasks, and enhancing efficiency and quality. In 2021, UNESCO introduced an AI strategy aimed at ensuring inclusive and equitable quality education. AI is already present in educational settings, posing complexities for the private sector and necessitating shared principles to steer development [5]. In education, AI technologies can manifest in three categories: applications and services directed at learners, those aimed at teachers, and those designed for educational administration. Furthermore, they can encompass six types: data analytics, machine learning, natural language processing, robotics, smart supply chains, and computer-aided design. In education, two approaches can be adopted: the direct application of education systems integrated with AI technologies and the indirect application of education systems that are bolstered by AI technologies. Recognizing the differences and nuances in defining AI technologies and their potential integration into education is crucial for subsequent discussions regarding the ethical ramifications of employing AI technologies in educational settings [7].

2.2 Applications and Benefits

With the global expansion of computer technology and the Internet, public engagement, inclusivity, and access levels have emerged as crucial elements of education across nearly all nations. Educational institutions at every level are adapting to the swiftly evolving landscape of communication and technology. Innovative learning modalities, teaching resources, and methods of knowledge distribution are on the rise. The significance of information technology applications in enhancing various facets of the educational process has been acknowledged as essential. These facets encompass the creation of learning materials, management of educational institutions, bureaucratic procedures within education, evaluation processes, and the improvement of teaching and learning experiences [8]. The focus has shifted from debating the use of Artificial Intelligence (AI) in education to determining the most effective ways to utilize and comprehend the implications of these tools. Understanding the technological and social ramifications is imperative for any nation to make informed choices. The last few years have seen artificial intelligence seep into the education sector. A technology-enhanced education system is very advantageous and can help bring increased accessibility, affordability, equality portability, interactivity usability efficiency effectiveness. The implications of such educational systems need to be understood from all possible perspectives, including the individual and societal standpoint about whether AI in education is seen as an opportunity by some individuals, countries or companies while others might consider it a risk. Likewise, perceptions about AI's role in education can differ from one society to another based on factors such as gender, race or educational background. Thus a clear understanding of AI in the educational context is necessary for its successful implementation within the cultural, social, educational ethical political frameworks [9]. Understanding the

applications of AI in education both for the present and future also calls for research efforts that cut across disciplines, involving expertise from such areas as technology, education, social sciences, psychology, ethics and politics.

3 Ethical Considerations in AI Development

The ethical considerations of developing and implementing AI technologies in the educational process are very important. Relevant ethical factors are bias, fairness, transparency, and accountability. And while the algorithms or technologies used in these systems may seem fair in themselves, they can cause ill effects or harm to students. Also, bias can be introduced by the AI educational technology itself. Education systems need to ensure that AI tools provided do not have bias injected into them during training using anonymized data that is later on used to achieve bias parameters making it difficult for detection [9]. Transparency is also overlooked due to being presented with complicated models that hold some difficulty to comprehend thus putting strict rules with inflexible guidelines will force compliance for a framework aimed at reducing bias parameters for all AI applications within educational settings. Independent audits should also become common practice among AI algorithms [10].

The rapid growth of AI in the areas of educational and learning analytics, with an avowed commitment to equity and fairness, brings to the forefront numerous challenges of misuse, algorithmic bias, and indeed other ethical issues. This chapter focuses on bias and fairness in AI systems developed for enhancing learning and education. It underscores the ethical value entailed in fairness, reviews cultural and psychological dimensions of this value, and presents an approach toward investigating AI-powered educational systems from the bias-and-fairness perspective to ensure both trustworthiness and scalability [11]. Educational AI systems that support recommendations based on decision-making can inherit biases related to socio-cognitive stereotypes introduced during the system's development or training processes, which might lead to students' being treated according to socially labeled groups based on stereotypes [11]. Therefore, the use of AI in educational data could be unfair. The disparities in treatment and outcomes could result from how unfair the application of AI to educational data is, further undermining trust in AI systems within education.

The AI hype can widen gaps in the way individuals and groups are targeted as well as outcomes for those at advantage or disadvantage, which in turn can further widen existing social inequalities and inequities, constrain the marginalized from value aspects, and sustain injustices in education [12]. The silver lining of this AI fairy tale presents a vision of equal opportunity; yet the prospect of AI systems in education must address: how to distinguish fairness from unfairness when dealing with what is known about biased models versus those that are unbiased? More subtle viewpoints caution against accepting technical fairness (or any other kind) at face value but rather

call for an analysis that appreciates human constructs and generalizations involved in fair models and classifications.

4 Psychological Perspectives on Bias

Increasing apprehension surrounds the effects of AI systems on the well-being of society, especially within the realm of education. Research on bias can aid in guiding interpretative choices and developing solutions for identified issues. From a psychological standpoint, it is crucial to differentiate between bias and discrimination in AI systems. There remains a lack of agreement regarding the design and management of AI systems in terms of comprehending and addressing bias. Bias is particularly pertinent in three distinct areas: the detection of hate speech on social media, recruitment processes, and models for credit scoring.

4.1 Cognitive Biases in AI Systems

The integration of Cognitive AI within educational settings raises a multitude of ethical issues surrounding the fairness and bias inherent in these systems. While biases can be broadly defined as errors or issues in judgment and decision-making, they can also be interpreted more narrowly from a psychological perspective [13]. For example, info-biases represent formal structures within AI systems that result in inequitable treatment, putting certain individuals at a disadvantage compared to others. On the other hand, human cognitive biases are viewed as a personal domain of AIs that requires management and reduction. A crucial initial step in this work is to pinpoint specific individual-level biases that affect AI systems utilized in education from a psychological standpoint. The goal is to comprehend the range of cognitive biases identified in psychology within the framework of AI in education. Many of these biases have the potential to directly impact decision-making, may be triggered by the design or perception of these systems, or can shape actions by altering their environment. The subsequent step involves examining methods to alleviate these biases or at least counteract their detrimental effects on AI systems [14].

Bias in AI is recognized as a set of distinct yet interconnected constructs that include both the structural elements of the systems and the contextual factors, such as human or societal biases, that influence AI decision-making outcomes. In this context, the biases within these systems are categorized into two types of knowledge: knowledge prior to understanding and knowledge following understanding. Consequently, bias in AI systems can be viewed as structural inaccuracies related to the former type of knowledge, such as the misrepresentation of input features or institutional biases. Regarding the latter type of knowledge, bias is perceived as a personal dimension of AI, characterized by a lack of awareness of contentious features impacting previous decisions, such as gender or ethnic background [15].

4.2 Implicit Bias in Educational Settings

Implicit bias involves the attitudes or stereotypes that unconsciously influence our perceptions, actions, and choices. These biases can emerge as either positive or negative assessments of individuals based on characteristics like race, gender, and age, often shaped by both direct and indirect messages throughout our lives. Operating beyond our conscious awareness, implicit bias causes us to inadvertently adhere to a biased narrative or utilize a biased lens in our observations and behaviors [15].

In educational environments, including teacher education programs, educators, teacher candidates, and policy analysts specific to education each bring their own set of experiences, beliefs, and biases. In these institutions, implicit biases surrounding race, gender, disability, and sexual orientation can drastically affect the process of making a decision. Attitudes toward certain students are influenced by such biases, which in turn lead to disparate treatment that may eventually affect the academic success of students [15]. Because these biases are often unconscious, the result of societal stigmas attached to various individuals or groups having seeped into our culture (causing students to be viewed under a prejudiced lens from the minute they walk into the classroom), it can be quite difficult to detect when one is behaving in a biased manner due to them being subtle most times. This subtlety makes it challenging to notice skewed behavioral trends resulting from bias.

AI has found its place in mainstream educational settings through various applications, including online learning platforms and remote assessments. Nonetheless, bias—which can find its way into decision-making processes—represents one of the major downsides of AI [16]. In thinking and building these applications, the creators should be aware of the weight of implicit bias within educational environments. This reflection gives a valuable perspective for a critical consideration and efforts to reduce bias in AI within educational contexts by large.

5 Impact of Bias in AI on Educational Outcomes

The use of AI in educational systems is increasing, providing core services especially in customized teaching, grading, and detecting students likely to fail, and the sharing of apprentices or trainees between institutions and administrative tasks. Yet without fairness mitigations these deployments can create or propagate biases [17]. The European Commission identified that employing AI systems into education is a high-risk area. In the same way that hiring algorithms or content moderation can negatively affect fairness student selection and grading algorithms might break anti-discrimination laws and increase the relationship between educational attainment and social class. Besides the risks, challenges, and opportunities that come up in developing AI-driven tools for education, there is a thought about who reaps the benefits of these AI systems. Even though students are the ones directly receiving support, other

stakeholders like teachers, parents, educational institutions or technology companies could benefit more from it.

Issues are raised about potential favoritism within user groups toward particular individuals. There are concerns about the negative effects on those impacted by AI, such as reduced access to education and inferior learning outcomes [17]. Also, there is the fear that teachers, as a consequence of their performance being reviewed, might be labeled as producers of automated low-quality work and this could cause a decrease in their wages or even replacement. The talk about algorithmic bias in education is often abstract and lacks connection with the real-life scenarios faced by the stakeholders. Often educational equity is misconceived to mean furnishing equal opportunities; this would imply a level playing ground during assessments. However, it is common that factors like students' social or contextual characteristics that influence their outcomes (including prior knowledge) are overlooked.

The emergence of AI systems, following a substantial increase in research funding and data within the education sector, has rekindled fresh concerns about their likelihood to unwittingly erode equity and worsen inequity in stakeholder imbalances, thus leading to injustices and breaches of achievement that impede social justice. Explicit attempts have been established to curb AI algorithms from entrenching discriminative practices based on factors such as race, ethnicity or gender [18]; however, indicators of other forms of exclusion—like the economic situation or parental background or home situation—are rarely taken into consideration. The introduction of biases has an especially strong impact on educational systems that run the risk of entrenching and deepening social stratification—as described by what is known as the Matthew Principle: "For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath." With the increasing privatization of educational services, artificial intelligence algorithms will assess academic qualifications for different services likely to influence decisions about enrollment in teacher training institutions, make or break educational referrals, facilitate or slow down early identification of disabilities and channel finances in terms of resource allocation to schools, among other functions [19]. Besides, certain types of educational services might not be available to some socioeconomic groups. Given the substantial societal implications, it is crucial that considerations of algorithmic fairness extend beyond the "safe" attributes of race, ethnicity, or gender to encompass additional class-based biases.

To attain fairness and equity in the predictive modeling of student achievements and educational data mining, it is essential to regard childhoods, families, and schools as comprehensive subjects of investigation, as inequalities are formed within these contextual settings [20]. Consequently, an analysis of socioeconomic bias must rely on data that differentiates between individuals' social circumstances and backgrounds. However, establishing fairness in education presents a complex challenge, especially concerning the definition of special educational needs or the implications of special educational services, including their provision, content, and effectiveness [20]. Addressing these issues requires a shift in perspective–from focusing on data, educational processes, and the delivery of data through algorithms to emphasizing

knowledge or human comprehension. Understanding educational processes as algo-grammar that generates actions inherently necessitates the encoding of vast quantities of both explicit and tacit knowledge into highly effective algorithms.

6 Mitigating Bias in AI Systems

There are various methods to reduce bias in AI. Adjustments in data collection and the algorithms used in AI can facilitate this process. A prevalent approach involves altering data processing techniques to minimize bias. To identify biases, language-based datasets might employ word embedding models. Prioritizing adjustments to the AI algorithms through techniques focused on algorithmic fairness is crucial, particularly when the algorithms are already operational.

6.1 Data Collection and Preprocessing

A pivotal phase in developing any AI system involves the scientific gathering of data and its expert management as a preprocessing step [20]. For AI systems in education, the data sourced from students and/or the performance of their applications is often not specifically intended for that use; instead, it tends to be collected from previous applications or default datasets from organizations. In such instances, biases related to data can significantly affect the effectiveness of AI applications [21]. It is crucial to focus intensely on the data utilized in AI systems, striving for an optimal scenario where the data originates from a methodical and scientific design that considers performance, purpose, population analysis, and cohort representation. Furthermore, biases related to data can also be corrected, mitigated, or adjusted through various data-handling techniques. Regardless, the significance of data cannot be overstated, as proper data management lays the groundwork for defining benchmarks, understanding fundamental cohorts, enhancing performance, and addressing data bias. The topics of bias and fairness have garnered considerable interest among both researchers and practitioners in the realm of data-driven systems [22]. An application for end-users evaluates a set of algorithms based on a data set and subsequently determines potential actions based on the results produced by those algorithms. Issues of bias and fairness are linked to the impact of these outputs on end-users and stem from various factors including data collection methods, preprocessing techniques, homogenization, as well as the parameters, architectures, and models of the algorithms [23].

6.2 Algorithmic Fairness Techniques

Considering the previously mentioned aspects of the AI-education relationship, along with recent global policy efforts advocating for the advancement of AI in educational settings, there exists a compelling reason to investigate algorithmic fairness methods in educational applications. While some AI tools for education are developed by local vendors, many widely utilized resources in educational institutions come from international corporations. This raises concerns that such tools may perpetuate and integrate biases rooted in systems created within different socio-political environments [23]. Therefore, alongside the exploration of algorithmic fairness techniques, it is crucial to comprehend the local educational policies and pedagogical perspectives regarding the implementation of AI applications. There is indeed a broad range of strategies aimed at achieving fairness in AI systems. A practical preliminary categorization of fairness techniques includes: pre-processing techniques, in-processing techniques, and post-processing techniques [24]. Pre-processing techniques focus on eliminating undesirable biases from the data before it is utilized for model training. In-processing techniques, on the other hand, concentrate on influencing the model's development itself to foster fairness, often by incorporating constraints or fairness terms into the objective function during the training process. In contrast, post-processing techniques enable the model to be generated without restrictions; however, these methods necessitate adjustments to the predictions to ensure fairness prior to their implementation or release. Three categories of techniques are characterized in a way that aligns closely with the educational context and perspective: technical solutions, social solutions, and socio-technical solutions. Social solutions are designed to involve social scientists, educators, students, or the broader educational community in discussions regarding bias and equity issues before the deployment of AI-based systems [24]. Conversely, technical solutions primarily concentrate on shaping the training, deployment, or usage of AI applications to ensure they function fairly on their own. Socio-technical solutions merge both approaches.

7 Conclusion

The ethics surrounding the use of AI in education is an area of increasing concern for both researchers and policymakers [25]. This chapter explores various ethical dilemmas associated with AI in educational contexts. The first dilemma addresses how to manage bias and fairness–two fundamental ethical principles relevant to AI applications in education. A summary of the existing literature on equity and AI in education is provided, highlighting both opportunities and challenges that lie ahead for future research. The second issue examined involves the psychological mechanisms that contribute to bias and fairness. Three heuristics related to fairness are reviewed, which individuals employ to promote fairness within socio-technical systems. These heuristics offer actionable starting points for the design of AI systems

in education that aim to achieve equitable outcomes. Potential implementations are considered, including the explicit or implicit integration of fairness heuristics into AI systems, as well as the development of transparency strategies that leverage these heuristics. Future research directions are outlined, emphasizing the necessity for more studies focused on user experience design, ethical considerations regarding heuristic design, and the need for interdisciplinary research teams. As educational leaders and policymakers increasingly tap into the potential of AI to foster equitable education, it is important to recognize that AI can also exacerbate systemic biases within the educational framework, potentially leading to negative effects on educational equity [2]. The conversation surrounding the ethics of AI use in education is quickly influenced by issues of bias and fairness. Within the fair AI community, multiple definitions or desiderata of fairness have been established. These definitions pertain to the effects of the AI algorithm, the choices made during data collection and model training, and crucially, the fairness-aware heuristics that individuals implement in socio-technical systems to promote equitable results. Notably, the connection between fairness and AI in education often revolves around unfulfilled commitments to equal opportunities and a lack of awareness regarding the distribution of risks tied to unfair results.

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Criminal Liability of Partners in Cybercrimes: An Analytical Study of Legislation, Legal Challenges, and Technological Developments



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Abstract This chapter represents the partners' criminal liability in cybercrimes under criminal law. The goal is to examine technological rules that determine the liability of partners and the resulting punishment and to consider whether such penalties are proportionate or not. Additionally, this chapter discusses how technological evolution has influenced establishing and proving the liability of partners in cybercrimes; it also identifies challenges and possible solutions. The research used an analytical methodology through scrutinizing legal texts and prominent judicial precedents. Results showed an indeterminate specification with partner liability in cybercrimes and that current penalties are not commensurate with the gravity of their impact. Moreover, technological evolution plays a big part in the determination and proof of a stakeholder's accountability in cyber offenses. This further underlines the need for statutory reforms to keep up with these advancements and variations within patterns of cybercrime.

Keywords Partner liability · Cybercrimes · Penalties · Technological advancement · Liability proof

1 Introduction

The evolving nature of cybercrimes make it necessary to define the scope of criminal liability with those engaged in committing these crimes. It is noted that the legal norms governing this scope are distributed in many related laws. Such a determination is very important for judicial practice, as it affects the individualization of

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punishment, and the specification of punishment for each participant in the crime. Hence, within the framework of cybercrimes, it is expedient to reveal directly issues related to determining the scope of criminal liability for accomplices.

Both the penalty for the principal and that for the accomplice are influenced by the criminal circumstances, within the scope of which some affect only the principal's penalty or certain specific accomplices.

This research, therefore, shall analyze Jordanian legal texts concerning partners' liability in cybercrime to bring out a clear picture regarding the subject laws and regulations. It considers previous judicial decisions to test the application of the law on partners and weigh the effectiveness of the prescribed penalties. Also considered in this study is a comparison between Jordanian legislation and its international and regional counterparts regarding partners' liability in cybercrime to determine uniformity of global standards that Jordan has aligned with.

1.1 Study Objectives

- Define the terms of your partner's liability for cybercrimes under Jordanian law.
- Analyze penalties for partners in cybercrime and their compliance with the principle of proportionality of act and punishment.
- Review of the provisions on complicity and incitement in the Jordanian Cybercrime Law and the General Penal Code.
- Investigate the impact of technological advances on the role of partners in cybercrime.
- Investigate the role of digital evidence in determining partner liability for cybercrimes.

1.2 Methodology

The research adopts a descriptive approach in analyzing partner liability in cybercrime under Jordanian law. This was done by scrutinizing legislative texts and case law related to the definition of frameworks and penalties for partners in cybercrime. In the analysis, Jordanian legislation was compared with international and regional laws regarding alignment of the penalties meted out with the principle of proportionality between the act and penalty.

2 Liability of Partners in the Context of Cybercrimes

Because of the strong similarities in the provisions regarding liability and punishment for the principal actor and the accomplice in cybercrimes, the applicable punishment for the accomplice raises a number of questions. The conditions provide no other alternative but to come up with legislation to resolve these issues. The first of these is regarding the conditions of liability for the accomplice in relation to the crime committed by the principal actor, which will be dealt with in our first section. The second issue relates to the punishment aspect concerning an accomplice in a cybercrime, which will be under our second section in this discussion.

2.1 Conditions for the Liability of Partners in Cybercrimes

In order for an individual to be held accountable for their involvement in a criminal act as an accomplice, there must be a clear connection between their actions and the main criminal act committed by the primary offender. This main act must also be considered illegal according to the law. To fully grasp the circumstances surrounding an accomplice's liability for the crime committed by the primary offender, it is important to examine the approach taken by the Jordanian legislator, which recognizes the principle of relative imitation in relation to accomplices. The accomplice's criminality stems from the crime committed by the primary offender, as there is no punishment for complicity in a crime that has not yet been initiated. To avoid any potential disputes or conflicting interpretations, the Jordanian legislator has specifically restricted forms of complicity and methods to felonies and misdemeanors, excluding lesser offenses, as outlined in Article (80/2/a) of the Jordanian Penal Code. Moreover, the Jordanian legislator has also accounted for subsequent actions taken by the accomplice after the commission of the crime, such as the concealment or disposal of the proceeds, as long as there was a prior agreement among the individuals involved in the crime (Article 80/2/e).

In Jordanian legislation, there is a clear distinction made between two groups of individuals involved in a crime. The first group, known as primary contributors, includes the actual perpetrators and their accomplices. The second group, referred to as secondary contributors, consists of instigators and those who incite others to commit the crime. This recognition by the Jordanian legislator demonstrates an understanding of the principle of the unity of the crime, although it is not absolute. In fact, the legislator treats instigation as a separate crime, rather than merely a form of complicity. Article (80/b) explicitly states that the liability of the instigator is independent of the liability of the person who was instigated to commit the crime. This distinction forms the material element necessary for holding an accomplice accountable. However, it is not enough for the accomplice to simply be involved in the crime. There must also be a mental and psychological connection among all contributors, with each individual desiring the intended criminal outcome. This

requires a comprehensive understanding of the role played by each contributor, as well as a conscious intention to participate. If there is no unified mental state among the contributors, the liability of the accomplice ceases, and the situation would be regarded as involving multiple crimes rather than complicity [1].

In the context of cybercrimes, the mental component of criminal intent is crucial for an accomplice. Since cybercrimes are categorized as intentional offenses, the accomplice must possess criminal intent. This intent, in the case of a cybercrime, takes the form of general intent, with the purpose of causing harm to another individual. However, if the accomplice is unaware that their actions are illegal, criminal intent cannot be established. Furthermore, if they lack knowledge about any aspect of the crime, criminal intent cannot be present. For example, in situations involving identity theft or incorrect affiliation, a data programmer may unintentionally modify information in documents without realizing the implications of their actions [2].

According to Article (40) of the Penal Code in Egypt, the legislator has made it clear that for someone to be considered an accomplice, they must have knowledge of the intended outcome and willingly participate in achieving it. The Court of Cassation in Egypt has emphasized the importance of specifying the intent to participate in the crime and the awareness of it at the time of its commission in their rulings. Failure to include these details in a judgment is considered a defect that requires its annulment [3]. The court also highlighted that intentional crimes require both the deliberate physical act and the intent for the result that follows. Therefore, it is essential to establish the accomplice's intent and awareness of the crime for them to be held liable. Any judgment lacking this information is considered deficient and must be annulled [4].

In order for an individual to be considered an accomplice to a crime committed by another person, there must be a strong mental and psychological connection between them. This connection entails the accomplice being fully aware of the criminal act and desiring the intended criminal outcome, or actively contributing to it. By doing so, the accomplice subjects themselves to the same legal consequences as the principal actor. However, if the accomplice's actions extend beyond the scope of the principal act, they are then categorized as complicit under Article (80/2) of the Jordanian Penal Code. In the realm of cybercrimes, the role of an accomplice is particularly important due to the technical aspects involved in the commission and successful execution of such crimes. Given that cybercrimes often rely on electronic means, the involvement of skilled intermediaries and other individuals becomes necessary. It is important to note that the accomplice's role is secondary and supportive, as they are not directly responsible for carrying out the crime. Their actions alone do not constitute a criminal offense; rather, their criminal liability stems from the actions of the principal actor and warrants punishment accordingly. The specific acts that qualify as complicity in felonies and misdemeanors are outlined in Article (80/2) of the Jordanian Penal Code. Any actions that fall outside the provisions of this article are no longer considered acts of complicity. According to Article (80/2), an accomplice in a felony or misdemeanor can be defined in several ways. Firstly, an accomplice is someone who guides and assists in the commission of the crime, leading to its occurrence. Secondly, an accomplice can be someone who supplies the

principal actor with weapons, tools, or any other items that aid in the commission of the crime. Additionally, an accomplice can be someone who is present at the location where the crime takes place. Moreover, an accomplice can be someone who assists the principal actor in actions that prepare, facilitate, or complete the crime. This includes individuals who were in agreement with the principal actor or other accomplices prior to the crime and who contribute to the concealment of evidence or disposal of the proceeds of the crime, either in whole or in part. Lastly, an accomplice can be someone who is aware of the criminal history of individuals involved in robbery or acts of violence against state security, public safety, or individuals or property, and who provides them with food, shelter, a hiding place, or a meeting location.

According to a ruling by the Jordanian Court of Cassation, it was determined that if a defendant simply provided a weapon to their accomplice and stood at the door of the room where the victim was located, while another defendant entered the room alone and committed the murder, and if the defendant later helped in concealing the body, they would not be considered the perpetrator of the murder under Article (76) of the Penal Code. Instead, they would be classified as an accomplice under Article (80) of the same law [5]. In the context of cybercrime and the role of an accomplice, a network computer engineer has the responsibility of connecting computers to each other and to the Internet for specific tasks. If this engineer utilizes their knowledge of the computer network's information system to assist individuals who have the intention of breaching, altering, or completely destroying the information system, their actions would be deemed as providing assistance through guidance, which is one of the forms of complicity outlined by the Jordanian legislator in Articles (82/2, 3) [6].

In Italy, there was a notable incident involving a criminal gang that was apprehended while trying to carry out a theft at a technologically advanced electronic bank by using credit cards. The gang employed a clever technique where they intercepted a truck and positioned it in such a way that the bottom of the truck could be opened and closed over a sewer drain on the road. This sewer drain housed optical fiber cables that connected the bank to its ATMs. The gang's objective was to manipulate these cables in order to gather crucial information about credit cards, including account numbers and available funds. They planned to record and decode this information, and then transfer it onto unregistered cards that they had obtained with the assistance of individuals working within the bank, who were motivated by incentives. As a result of this incident, Italian banks took immediate action to bolster their security measures and strengthen the encryption of information transmitted through the cables [7].

The evolution of complicity in crimes involving physical presence of the accomplice, such as aiding and abetting the perpetrator's plan and execution, is a notable development. However, in the realm of cybercrimes, the concept of complicity should not be confined to traditional forms. It should encompass new forms that align with technological advancements, taking into account the role of contributors in cybercrime and the ethical behavior that forms the basis for criminalization. Additionally, the tools utilized in these crimes, including computer technologies, information systems, and electronic means, should be considered [8].

The use of sophisticated software by cybercriminals poses a significant challenge in tracking their digital footprint. This advanced technology allows them to manipulate their electronic address, either by broadcasting a fake address to hosting servers or by remotely erasing any traces of their activities. As a result, identifying the culprits behind these criminal acts becomes increasingly difficult [9].

The issue of proof, specifically digital evidence, is a matter of utmost importance. What sets this type of evidence apart in cases of cybercrimes is its resilience, making it nearly impossible for perpetrators or their associates to dispose of or hide it from computers or the Internet. Specialized software can be utilized to recover digital evidence [10].

The acquisition of digital evidence involves the examination of internet connections, tracing the route of data and information during transmission or retrieval. Electronic surveillance entails the monitoring of the designated host server using specialized software, enabling the identification of the host and subsequent tracking of their browsing activity and the exchange of information [11].

3 Penalty for the Accomplice in Cybercrime

In order to be held accountable for participation in a crime, specific prerequisites must be met. These include the commission of the initial offense and the existence of both material and moral unity within the criminal plan, indicating that it is a single crime with a singular outcome. Moral unity necessitates a mental connection among the participants regarding the criminal project. Additionally, there must be multiple individuals involved, each assuming different roles [12].

In order to comprehensively outline the consequences faced by accomplices in cybercrime, we shall examine the penalties prescribed by both the Cybercrime Law and the Penal Code, as well as the influence of various criminal circumstances on said penalties.

3.1 Penalty for the Accomplice in Cybercrime Under the Cybercrime Law

Article (14) of the Jordanian Cybercrime Law No. (15) of 2015 outlines the consequences for individuals involved in cybercrimes as accomplices, participants, or instigators. The article states that those who intentionally engage, interfere, or encourage the commission of any of the offenses specified in the law will face the same punishment as the actual perpetrators of those crimes [13].

From the above text, we can deduce the following [13]:

- There is a notable disregard for the established regulations in the Penal Code concerning criminal involvement, as it deviates from legal reasoning and undermines the principle of proportionality in punishment. This deviation is evident in the equal treatment of both the principal offender and the accomplice, as well as the various forms of criminal participation. The actions of accomplices in cybercrime are comparatively less severe than those of the main perpetrator, which contradicts the fundamental principle of justice that requires equal treatment within the realm of criminalization.
- By focusing solely on the accomplice as the participant, there is a departure from the overall regulations outlined in the Penal Code. This adherence to the legal principle of secondary involvement in intervention and instigation is in accordance with established doctrine.
- In a departure from the typical regulations outlined in the Penal Code, the Jordanian legislator decided to impose equal penalties for both instigation and intervention, deviating from the usual practice of punishing the accomplice and instigator based on the original perpetrator's penalty.
- Despite being recognized as a form of secondary participation in established legal doctrine, the issue of concealment was not addressed by the Jordanian legislator in the Cybercrime Law.
- The legislator in Jordan has embraced the concept of absolute borrowing, imposing penalties on individuals who knowingly engage, intervene, or encourage the commission of any cybercrimes outlined in the legislation, mirroring the punishment of the primary offender.

The explanatory memorandum for the Cybercrime Law No. (27) of 2015 provides a justification for its provisions. It argues that because information system crimes often require specialized technical knowledge, individuals with expertise in carrying out these crimes, including those who cannot be held legally accountable such as children or those lacking legal capacity, are sometimes utilized to commit these offenses. Recognizing the gravity of incitement and involvement in information system crimes, which is considered on par with the actual act itself, the law imposes the same penalties for those who participate, intervene, or incite as it does for the primary perpetrator.

3.2 Penalty for the Accomplice in Cybercrime Under the Penal Code

Instead of the Cybercrime Law, the Jordanian legislator decided to assign criminal liability for involvement in specific cybercrimes under the Penal Code. According to Article (15) of the Jordanian Cybercrime Law, individuals who commit offenses punishable by law using information networks, information systems, or websites, as well as those who participate, intervene, or incite such acts, will face penalties as outlined in the relevant legislation [14].

According to the information provided in the preceding passage, it can be observed that the Jordanian legislator has established a parity in terms of punishment for individuals involved in cybercrimes, regardless of their specific role. This includes both the primary offender and any accomplices or co-participants, as well as secondary participants like interveners and instigators. This equitable approach to sentencing has been implemented by the Jordanian legislator through [14]:

1. Deviating from the general rules of participation in the Penal Code by equating the punishment between these parties, despite the fact that the crimes subject to Article (15) fall under the Penal Code.
2. Deviating from the general provisions of the Penal Code by considering only the accomplice as the intervener.
3. Departing from the general rules in the Penal Code by punishing instigation and intervention with the same penalty as the original perpetrator.
4. The Jordanian legislator in the Cybercrime Law did not address concealment, even though it is a form of secondary participation according to established legal doctrine.

According to Article 15 of the Cybercrime Law, individuals who commit crimes using the information network, an information system, or a website, or those who participate, intervene, or incite the commission of such crimes, are subject to penalties as prescribed by the relevant legislation. This indicates that the legislator considers crimes committed via the information network or a website to be equivalent to traditional crimes occurring in the physical world [15].

In a specific case, where the victim was sixteen years old and the appellant engaged in a romantic relationship that developed into communication through the Messenger program via video calls, the court found the appellant guilty of the felony of indecent assault under Article 298/1 of the Penal Code. The court also relied on Article 15 of the Cybercrime Law to support this conviction. As a result, the appellant was sentenced to three years of temporary hard labor, along with the associated costs.

In conclusion, the court deemed the decision to convict the appellant and impose the aforementioned sentence as legally appropriate. The grounds for appeal were found to be unsubstantiated [15].

3.3 The Impact of Circumstantial Factors on the Penalty for the Accomplice in Cybercrimes

The legislative texts that govern the penalty for an accomplice in a crime take into account the specific circumstances surrounding the offense, whether they are of a personal or material nature [16]. These circumstances can pertain to the crime itself or to the individuals involved, including the perpetrator and the accomplice. It is important to note, however, that the assistance provided by the accomplice does not impact the liability of the perpetrator, as their criminal responsibility is determined solely by their own actions and not by those of the accomplice [17].

Hence, this particular segment of the research is subdivided into two primary aspects: the initial aspect examines how personal circumstances affect the penalty imposed on accomplices in cybercrimes, whereas the subsequent aspect explores the influence of material circumstances on the penalty for accomplices in cybercrimes.

The Impact of Personal Circumstances on the Penalty for the Accomplice in Cybercrimes

The personal circumstances of the accomplice are not taken into account as essential components of the offense; instead, they pertain to the individual and factor into the assessment of their deservingness of punishment. The personal circumstances of the perpetrator have no bearing on the penalty imposed on the accomplice, as these circumstances are personal in nature and do not stem from the perpetrator themselves. These circumstances can either exacerbate or alleviate the situation [18–20].

Article (79) of the Jordanian Penal Code, as stated by the Jordanian legislator, outlines the impact of various material factors that can either worsen, lessen, or even exempt individuals from punishment. These factors are applicable to all individuals involved in the crime, including accomplices, interveners, and instigators. The circumstances can be categorized as material, personal, dual, or mixed, and are further elaborated upon in the following paragraphs:

1. **Material Reasons**: The material aspects of a crime encompass various factors, such as the act itself, the time and location of its occurrence, and the methods employed. These elements also extend to the severity of the offense. According to legislative provisions, these considerations apply to all individuals involved in the crime, regardless of their level of participation, whether it be aggravating or mitigating, as long as they possess knowledge of the crime and its repercussions. While the Egyptian legislator does not have an identical text to that found in the Jordanian Penal Code, legal doctrine and jurisprudence typically extend these substantive grounds to all individuals involved in the offense, regardless of their awareness of them [21].
2. **Personal Reasons**: The factors that influence the severity of punishment for an individual criminal can be categorized as mitigating, aggravating, or exempting. These factors are taken into consideration solely in relation to the individual offender and have an impact on their punishment, either by lessening it or exempting them from it. On the other hand, aggravating circumstances affect all individuals involved in the crime, whether they are the perpetrators, accomplices, interveners, or instigators. It is important to note that these circumstances only come into play if they facilitated the commission of the crime [22].
3. **Dual (Mixed) Reasons**: These factors encompass both personal and material elements. The personal element pertains to the individual committing the crime, while the material element pertains to the impact that modifies the criminal characterization [23].

In the case of forgery in an official document, if the person involved is a public official, the punishment for the accomplice does not become more severe unless they were aware of the official capacity of the perpetrator when they participated. This

same principle applies to cases of rape or indecent assault, where if the perpetrator is a relative of the victim or falls under the categories mentioned earlier [24], the punishment for the accomplice remains unchanged [25–28].

In accordance with the Egyptian Penal Code, it is acknowledged that an accomplice may be subject to the same circumstances as the original perpetrator, provided that the accomplice is aware of these circumstances. Article (41) of the code explicitly states that the accomplice will not be affected by any specific circumstances that would alter the criminal classification based on the intent or knowledge of the perpetrator. Instead, the accomplice will be punished based on their own intent or knowledge, aligning with that of the perpetrator.

The legislator in Jordan has recognized the influence of dual circumstances on the accomplice, as long as these circumstances are directly responsible for the occurrence of the crime. According to paragraph two of Article (79) in the Jordanian Penal Code, "The consequences of aggravating dual circumstances that led to the commission of the crime shall be applicable to them." The determining factor in deeming a dual circumstance as the cause of the crime is that the crime would be unattainable without it.

Upon examining the previous passage extracted from the Jordanian Penal Code, it becomes evident that the accomplice's awareness of the dual circumstance that led to the commission of the crime is not a requirement, even if they remain unaware of it [29]. In terms of cybercrimes, the Jordanian legislature has embraced the principle of absolute transference for secondary participation. Consequently, when the criteria for participation and aggravating dual circumstances are fulfilled, it becomes necessary to differentiate between the circumstances stemming from the original act of the cybercrime, which also apply to the accomplice in the cybercrime, regardless of their precise understanding of the aggravating dual circumstance. If the perpetrator of the cybercrime is not subject to punishment due to personal factors, such as lack of discernment, the accomplice will likewise be exempt from punishment. However, the personal circumstances of the accomplice in the cybercrime do not impact the perpetrator, while the material circumstances exert their influence on both the perpetrator and the accomplice in the cybercrime [24].

In a ruling, the Egyptian Court of Cassation established that if a criminal act undergoes a change in its characterization due to certain circumstances, the accomplice cannot be held accountable for these circumstances unless they were aware of them. In such instances, the court must provide evidence of the accomplice's knowledge in order to pass judgment [29].

While the description of the crime remains unaffected, the presence of personal circumstances for the accomplice has the power to alter the severity of the penalty. It is important to note that the accomplice and the perpetrator are subject to different penalties due to the personal nature of these circumstances. Regardless of whether these circumstances are aggravating or mitigating, if the accomplice is a minor, they will be subject to the provisions outlined by the law, while the perpetrator will not be affected by these provisions unless they too are a minor. Additionally, any legal impediment that impacts the accomplice will exclusively apply to them [30].

Impact of Material Circumstances on the Penalty for Participants in Cybercrimes.

The legislator defines material circumstances as incidental facts that are exhaustively described and not open to extension. These circumstances are added to a crime to either increase or decrease its penalty, and their impact also applies to accomplices. The theory of vicarious liability serves as the basis for responsibility under these circumstances, as it embodies the principle that all participants in a crime share the same intentions and encompass all material elements and circumstances, including these material circumstances. Therefore, material circumstances are applicable to both perpetrators and accomplices, regardless of their awareness of them. Examples of such circumstances include the presence of a weapon in theft cases and the bank-related aspect in cybercrimes.

The depiction of the offense and the involvement of an accomplice are both impacted by any modifications in these conditions. The accomplice's culpability is derived from the principal's criminal act, regardless of their awareness of the circumstances or whether they are aggravating or mitigating [31–34]. Instances of such circumstances can be found in cybercrimes, such as the sexual exploitation of children and individuals with disabilities, as well as acts of espionage.

In order to encompass all individuals involved in a crime, justification reasons must be clearly defined, as recognized by legislation. These reasons have the power to convert an unlawful act into a lawful one, eradicating its criminality and undermining its legality. As a result, the legality of the act is extended to all individuals involved in the crime, whether they are the main perpetrators or interveners [19].

The Egyptian legislator faced a dilemma when it came to extending justification reasons to participants. Article (42) stated, "If the perpetrator of the crime is not punished due to a justification reason, the accomplice must still be punished according to the legal penalty." However, this perspective cannot be accepted, as evidenced by Article (43) of the Egyptian Penal Code, which declares, "Whoever participates in a crime shall be punished for it even if it is not the one they intended to commit, provided that the crime occurred as a result of provocation, agreement, or assistance." The aggravation of the outcome due to the involvement of material circumstances should not be interpreted as creating a separate potential outcome distinct from the direct result. The occurrence of material circumstances that lead to the desired direct and probable results by the accomplice holds them responsible for these outcomes. Moreover, Egyptian Cassation Court rulings have extended the application of aggravated material circumstances to the penalty of the accomplice, as stated in one of its verdicts [35–38]: "Carrying a weapon during theft is an aggravating material circumstance connected to the crime and must be applied to all those who participated in it, whether as perpetrators or accomplices, even if they were unaware of it.

The stance of the Jordanian legislator is unambiguous when it comes to extending the impact of aggravating material circumstances to all individuals involved in the offense. Article (79), Paragraph 1 of the Jordanian Penal Code explicitly declares: "The consequences of material circumstances that intensify, diminish, or exempt

from punishment are applicable to all accomplices and interveners in the crime" [22].

The Jordanian Penal Code, specifically Article (79), Paragraph 1, ensures that all individuals involved in a crime are subject to the same exemptions based on material circumstances. This includes accomplices and interveners. The exemption circumstances, as outlined in Articles (60, 341) of the Jordanian Penal Code, such as self-defense, performing duties, and defense of dwellings, have been provided by the legislator. The aforementioned law, Article (342), specifically addresses the defense of dwellings [25].

The researcher's perspective, which is shared by some scholars (33), posits that the presence of justification reasons in a criminal act negates its legal element and eliminates the criminality of the act. This principle applies to all individuals involved in the crime, asserting that their participation becomes lawful once the justification reasons transform the act from criminal to legal. Consequently, it becomes illogical to punish an act that is deemed lawful. Therefore, if a person aids someone in a situation of self-defense, they also benefit from the justification reasons, as their involvement aligns with the criteria for justification. As a result, the intervention becomes lawful and non-criminal, in accordance with the extended justification [19, 26, 35].

The legislator has established comprehensive regulations pertaining to material circumstances, whether they serve to worsen or alleviate the situation. Legal provisions take into account specific circumstances and rationales that warrant deterring offenders and imposing the most severe penalties beyond what is typically prescribed. These provisions also grant the court some discretion. For instance, when it comes to theft with counterfeit keys under Article (404) of the Jordanian Penal Code, carrying a weapon, or theft from a place intended for habitation or religious sites, these circumstances are attributed to the aiding accomplice, even if they were unaware of their existence. The gravity of the aiding accomplice's involvement is further emphasized if they provided the perpetrator with means that are considered aggravating circumstances, such as guiding them to steal from a religious site or assisting during a time that is deemed aggravating [26].

The Jordanian Cybercrimes Law treats the principal perpetrator, intervener, and instigator as equals, imposing the same penalty on all individuals involved, regardless of their role or level of participation. This approach extends the punishment to both perpetrators and participants when specific circumstances are present. Similarly, the Egyptian judiciary holds both perpetrators and accomplices responsible for material circumstances. In one ruling, it was stated that even if an accomplice was unaware that the perpetrator was carrying a weapon, the presence of the weapon during a theft would still be considered an aggravating material circumstance.

4 Conclusion

To summarize, this research offers a comprehensive examination of the accountability of individuals involved in cybercrimes under Jordanian law. Through an analysis of legal documents, court decisions, and a comparison of local regulations with global standards, significant insights into the legal obstacles related to such offenses have been uncovered.

4.1 Results

The study reached the following conclusions:

- In accordance with Jordanian law, any act of intervention must be directly linked to the original criminal act and subject to legal consequences.
- Under the provisions of the Jordanian Cybercrimes Law, the punishment for an accomplice involved in cybercrimes is equivalent to that of the main perpetrator.
- Within the Jordanian legislature, a clear distinction is made between primary participants and secondary participants, which includes interveners and instigators.
- According to the laws of Jordan, instigation is recognized as a distinct offense and is not categorized as a type of intervention.
- The significant role of the accomplice (intervener) becomes crucial in cybercrimes due to the requirement of technical expertise.
- The role of digital evidence is vital when it comes to establishing the culpability of an accomplice in cybercrimes.

4.2 Recommendations

- Reassess penalties imposed on cybercrime accomplices to achieve proportionality between offense and punishment.
- Strengthen legislation to keep pace with technological advances and address the role of accomplices in cybercrime.
- Develop cybercrime forensics and digital evidence to ensure justice.
- Increase the awareness of information technology professionals about the legal risks associated with involvement in cybercrime.
- Encourage cooperation between legal and technological actors to develop effective policies to combat cybercrime.

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Revolutionizing Space Exploration and Satellite Communication with Blockchain Technology



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Abstract Blockchain's decentralized, secure, and transparent nature positions it as a game changer in space exploration and satellite communication. This paper explores blockchain's potential to enhance mission planning, logistics, and data management by providing secure, transparent platforms for tracking resources, schedules, and contracts, thereby reducing errors and delays. Smart contracts can automate data sharing and processing, improving operational efficiency. Additionally, blockchain can bolster interagency collaboration and address spectrum management issues in satellite communication. Despite its promise, challenges such as scalability, high energy consumption, and regulatory concerns remain. Solutions like sharding and energy-efficient consensus algorithms are proposed to address these issues, highlighting blockchain's transformative potential in these critical domains.

Keywords Blockchain · Space exploration · Satellite communication · Smart contracts · Hardhat · Technological progress

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1 Introduction

Space has historically been an endeavor full of challenges, one of the most important being that there needs to be a secure and reliable way of transmitting data between Earth and spacecraft. There is a need to provide security in communication, starting from interplanetary probes to space telescopes. The traditional ways of data transmission have vulnerabilities, but now, with emerging technologies like blockchain, space data communication can be reimagined.

A great potential for the security and efficiency of data transmission in space missions lies within the decentralized, secure, and transparent blockchain technology. Blockchain helps to develop a tamper-proof platform for space missions that is completely secure and integrity-bound with respect to data exchange, thereby eliminating unwanted and unauthorized access or manipulation of data. The paper presents the application of blockchain technology in space exploration and satellite communication, which could potentially revolutionize mission planning, logistics, and data management. Blockchain is seen providing efficient and accurate tracing of resources, schedules, and contracts on a secure and transparent platform, thereby eliminating errors and delays. Smart contracts, one of the base features of blockchain, can further automate data sharing and processing to enhance operational efficiency [1–5].

More relevant to international space missions is the ability of blockchain to improve interagency cooperation. Blockchain can offer a very secure and transparent platform for sharing data among different space agencies, making smooth communication and coordination possible and therefore increasing the extent of cooperation and efficiency.

However, there are specific problems to the use of blockchain in space exploration. With scalability and high energy consumption important issues, followed by regulatory concerns, the effort to implement this technology faces too many difficulties. Proposed solutions include sharding and energy-efficient consensus algorithms that can enable the massive application of blockchain in space missions [6–9].

2 Background

Space exploration is an application domain that is highly dependent on precision, security, and reliability. Space missions, whether interplanetary probes, space telescopes, or manned missions, are quite complex and require robust systems not only for planning missions and managing data but also for interagency collaboration. Traditional mechanisms of transmission and coordination, while effective to a great extent, have increasingly been haunted by issues such as breaches in data, miscommunication, and logistical inefficiencies. The need for secure, transparent, and efficient systems becomes more critical as the complexity and scale of space missions increases.

Initial Blockchain in Space Exploration

The following sections will demonstrate the exact applications of blockchain technology in space exploration missions with respect to mission planning and logistics, data management, and interagency collaboration in such a scenario.

Mission Planning and Logistics: It enhances mission planning and logistics through a safe, transparent, and decentralized platform that keeps track of resources, schedules, and contracts. It thus assures integrity and real-time access to data for each concerned actor, reducing errors, miscommunication, and delays. Smart contracts automate execution according to the terms of agreements, enforcing them without intermediaries.

Data Management: Blockchain technology solves the problems associated with data management in space missions by decentralized, secure, and transparent data storage and transfer. The decentralized approach of it reduces risks of data loss or cyber-attack; cryptographic hashing ensures integrity, while smart contracts automate the sharing and its processing, hence improving operational efficiency.

Inter-Agency Collaboration: It empowers secure and transparent communication and collaboration among many space agencies, private companies, and research institutes. Blockchain provides a decentralized platform for sharing data among them. This builds trust and accountability. Smart contracts automate the process of interagency coordination, hence decreasing manual interventions and ensuring secure and efficient collaboration.

Blockchain in Satelite Communication

Basically, blockchain technology is promising a very great solution for the security and efficiency of satellite communication networks. Blockchain can be used to create tamper-proof platforms that assure data integrity, therefore avoiding unauthorized access to communication networks and increasing transparency. Blockchain provides great resilience to cyber-attacks and robust mechanisms for data verification and authentication through its decentralized architecture and cryptographic techniques.

Secure Communication Networks: The satellite communications networks are a part of global connectivity. Still, they remain susceptible to cyber-attacks, signal interference, and other security threats. Blockchain technology seems considerably instrumental in enhancing the security of the satellite communication networks by providing a decentralized, tamper-proof communication platform. This makes blockchain highly resistant to attacks because of its nature of decentralization, which dictates that the data does not reside in one location. Every node in the network contains a replica of the blockchain. Changes to the data are then assuredly approved by the network through consensus mechanisms. These cryptographic techniques that provide integrity and authenticity to the data against cyber attacks are hashing and digital signatures. Blockchain provides enhanced transparency and traceability to every end-to-end trail of all exchanges of data.

Improved Security: Satellite communication systems are vulnerable to cyber-attacks. Blockchain can give them an added layer of security by making sure that all transactions and communications are recorded in a ledger that is tamper-proof.

Spectrum Management: It makes the satellite communication system spectrum management more transparent and immutable. In other words, it is a very decentralized, distributed ledger-keeping system of all transactions for spectrum usage, hence providing reliable data to stakeholders for the solution of possible disputes and building trust. The smart contracts automate spectrum management tasks, making operations more effective while reducing their administrative overheads. Besides, blockchain enables dynamic spectrum sharing and optimizes resource usage subject to low interference risks.

Secondary Encryption Phase

Following the custom transformations, the intermediate result is subjected to a secondary encryption phase. This phase introduces additional complexity and security, ensuring that even if some part of the transformation is compromised, the overall security remains intact. The secondary encryption phase includes:

Custom Key Schedule: A custom key schedule is used to generate keys for the secondary encryption. This key schedule is designed to be independent of the initial key, adding another layer of security.

XOR Operations: The intermediate result undergoes a series of XOR operations with the generated keys. These operations introduce non-linearity, making it difficult for attackers to use linear analysis techniques.

Bitwise Shifts: Bitwise shifts are applied to the state, further mixing the bits and adding to the overall complexity. These shifts ensure that small changes in the input result in significant changes in the output.

Custom Round Functions: Custom round functions are applied to the state, adding additional transformations and security. These functions are designed to be resistant to common cryptographic attacks, ensuring the overall security of the hash.

Encoding and Final Transformation

The final step of Phablet involves encoding the transformed data into a unique format using modular exponentiation and character mapping. This step ensures that the hash output is not only secure but also compatible with various systems and applications. The encoding process includes:

Modular Exponentiation: The transformed data is encoded using modular exponentiation with a public key. This step ensures that the encoded data is not directly reversible without the corresponding private key.

Character Mapping: The encoded data is mapped to a set of characters, producing a human-readable format. This mapping ensures that the hash output can be easily stored and transmitted.

Final Hash Output: The final hash output is produced by combining the encoded characters. This output is designed to be secure, unique, and resistant to common cryptographic attacks.

3 Methodology

The research is performed to identify the potential of blockchain technology for increasing space exploration and satellite communication. Concretely, smart contracts will be realized. This methodology will cover a systematic approach, including a literature review, system design, simulation, and analysis.

Initial Blockchain in Space Exploration

The following sections will demonstrate the exact applications of blockchain technology in space exploration missions with respect to mission planning and logistics, data management, and interagency collaboration in such a scenario.

System Design: In view of the literature reviewed, we design a blockchain-based framework tailored for space missions and satellite communications. Thus, elements for this framework include:

Decentralized Ledger: A decentralized ledger recording activities in mission planning, logistics, and data management to provide maximum transparency and security during operations.

Smart Contracts: The establishment of smart contracts that allow for self-execution according to an agreement or a set of rules. Smart contracts are assigned to schedules, resources, and contracts in the case of mission planning. In satellite communication, they facilitate the process of spectrum management and secure data exchanges.

Cryptographic Techniques: It will make use of cryptographic hash and digital signatures to ensure integrity and authenticity of data.

Consensus Mechanism: The choice of an appropriate consensus mechanism, such as Proof of Stake or Byzantine Fault Tolerance, provides improvement in scalability and reduction of energy consumption.

Simulation and Implementation

Testing the feasibility and performance of the proposed framework is implemented in a simulated environment. This would involve developing and deploying smart contracts using blockchain development platforms such as Ethereum or Hyperledger. This simulation includes:

Mission Planning and Logistics: We will simulate a space mission, which will assess how Blockchain keeps a trace of resources, schedules, and contracts.

Data Management: This consists of evaluating the efficiency and safety of blockchain-based data storage and transfer.

Interagency collaboration: This involves testing the framework on its capability to provide a secure and transparent form of communication between different space agencies.

4 Implementation of Smart Contracts

In space exploration and satellite communication, smart contracts would be implemented using the development, deployment, testing, and checking of functionality, security, and efficiency. This section shows the steps and procedures used in this study, focusing on Hardhat in testing and deploying contracts on the Sepolia Network (See Table 1).

Smart Contract Development

On this note, Solidity is used for the development of smart contracts that will manage critical functions in the framework of blockchain-based space exploration and satellite communication. This would involve needs-specific contracts to data management, access control, and resource allocation. The following are the smart contracts:

Data Management: Secure recording and retrieval of mission data by the contracts make all data exchanges transparent and immutable.

Access Control: Through strict access control policies, smart contracts ensure that sensitive information can only be accessed or changed by authorized parties.

Resource Allocation: Contracts mechanize resource allocation, such as bandwidth or computational power, based on predefined rules and mission operation optimality, while minimizing administrative overhead.

Smart contracts are designed to execute tasks like energy transactions management and automate processes involved in satellite communication and space mission logistics.

Deployment

The developed smart contracts are deployed on the Sepolia Network with Hardhat. It is an efficient development environment for Ethereum (See Fig. 1). The following are the processes to be followed to complete the deployment:

Table 1 Testing cases

Test case	Description	Expected outcome	Actual outcome	Status
Deploy contract	Deploy the smart contract to the Sepolia network	Contract is deployed	Contract is deployed	Pass
Data integrity	Verify the integrity of the data	Data matches	Data matches	Pass
Unauthorised access attempt	Attempt unauthorised access to the data	Access is denied	Access is denied	Pass
Automated resource allocation	Test resource allocation via smart contract	Resources allocated	Resources allocated	Pass

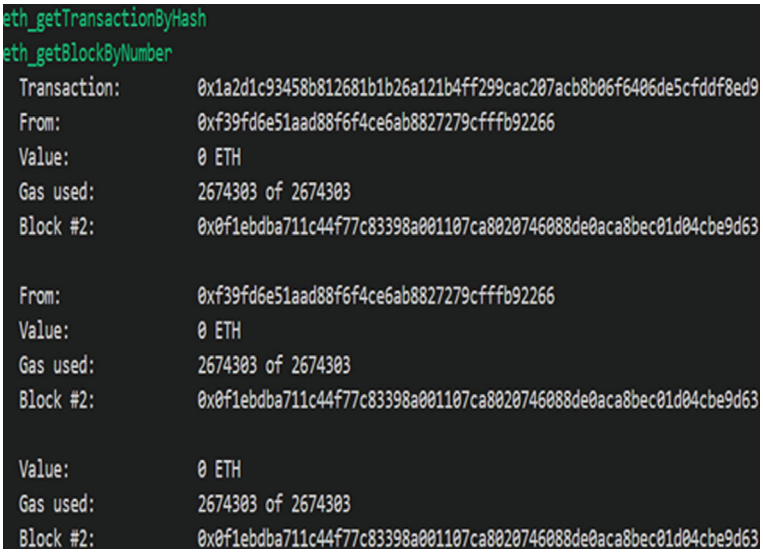


Fig. 1 Deployment

Contract Deployment: The smart contracts will get deployed on the Sepolia Network to check the functionality testing in a simulated environment.

Network Integration: Ensuring that the contracts interact appropriately with the Blockchain network and are accessible for execution and interaction.

Hardhat makes this quite easy with its facilities for deployment and contract management, so that the work goes smooth in its deployment.

Testing

The testing of smart contracts is done thoroughly to ensure that they work correctly and meet all the security and performance requirements. The following are the tests conducted:

Deployment Validation: This test ensures that the smart contract has been properly deployed to the blockchain and can be seamlessly accessed. This test case ensures that the Contract Address is correctly recorded on the Sepolia Network (See Fig. 2).

Data Integrity Checks: This test ensures that data processed by the smart contract is valid and reliable. Checks the correctness of data read from the blockchain, and matches it with values stored and recorded by the contract.

Security Testing: This test assesses the ability of the contract to prevent unduly granted access to the respective data. Entails trying to access or even modify data without proper authorization and ascertains that it is restricted.

Resource Allocation Testing: It checks that the resources are very well allocated with respect to bandwidth or computational power in adherence to rules defined in a smart contract. Testing ensures automation in resource distribution while meeting the laid-down criteria for this.

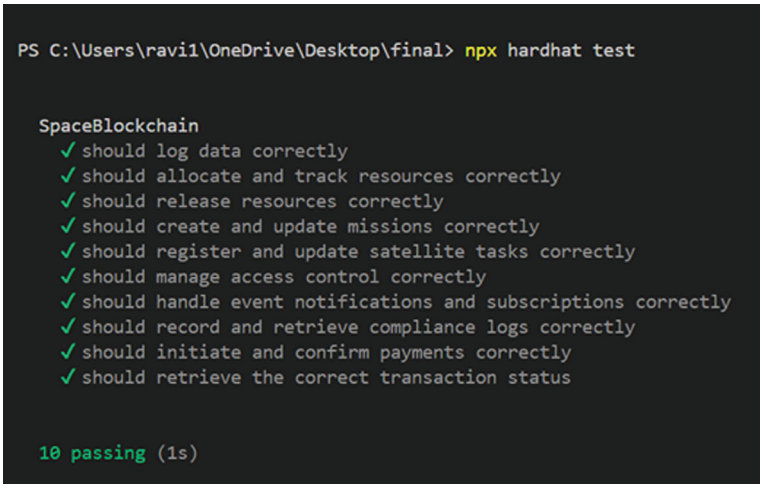


Fig. 2 Deployment validation

It is ensuring, through the running of these tests, that the smart contracts are secure, efficient, and functional to effectively support the objectives of revolutionizing space exploration and satellite communication with blockchain technology.

Implementation Challenges

To Challenges in implementing blockchain technology with space exploration and satellite communication to ensure effective integration include:

Scalability: Traditionally, all transactions on a blockchain are processed and stored by every node on it. In this regard, given the huge data amount and high frequency of transactions that will be usual in space missions and satellite communication, bottlenecks may occur. This is mitigated through solutions like sharding and Layer-2 protocols. Sharding involves the fragmentation of blockchain into bits that are more manageable, hence allowing parallel processing in transactions. Off-chain Layer-2 solutions, such as state channels, reduce the stress placed on the main network, which makes it scalable in turn.

Energy use: Traditional blockchain networks, particularly PoW, consume a large amount of energy. That is worrisome for applications in space where energy resources are limited. Other alternatives like proof of stake and hybrid consensus algorithms can help in offering more energy efficiency. In PoS, instead of solving computationally intensive puzzles to validate a block, validators have to stake cryptocurrency. Hybrid consensus algorithms combine multiple consensus mechanisms that balance energy efficiency, security, and performance.

Regulatory Issues: There are regulatory issues surrounding the adoption of blockchain in space exploration and satellite communication. These will have to be changed, allowing for blockchain-based solutions to operate, particularly in such

areas as spectrum management, data privacy, and security. If the broadened adoption of blockchain technology within these critical domains is to be achieved, such compliance is needed, adhering to international regulations and standards.

5 Results and Discussion

Application of blockchain technology, more so through smart contracts, has shown great promise in space exploration and satellite communication. The case involved the implementation of smart contracts on the Sepolia Network, which successfully automated a number of key processes with respect to resource allocation and data management, resulting in reduced operational costs and a rise in efficiency.

Testing Outcomes: The developed smart contracts are validated to be robust and secure. Successful deployment of the contracts into the Blockchain network confirmed that they had been successfully integrated and were accessible for execution. Data integrity checking proved that the information managed by these contracts was accurate and consistent, with absolutely no discrepancies noted. Security testing proved that unauthorized access was duly disallowed, in effect proving that only an authorized entity can access the functionality developed within the contract. Also, the tests on resource allocation showed that resources were allocated following the rules of the contract; therefore, management in this sphere was automated.

6 Conclusion

Blockchain has huge potential for space and satellite communications because it can help solve major problems related to data transmission, security, and operational efficiency. Given the growing complexity of space missions and ever-demanding needs for the availability of a communication system, blockchain itself brings some solutions to the table: immutability, decentralization, and cryptographic security.

Blockchain in space exploration provides a decentralized and immutable platform to increase efficiency in mission planning and logistics by providing an exact record of resources, schedules, and contracts. Smart contracts automate several processes, reducing errors and delays to improve operational efficiency. Entailing integrity in data, it allows secure data management, which is particularly useful in any space mission where information accuracy and reliability are very critical. In satellite communication, blockchain technology can reduce the vulnerabilities associated with cyber attacks and signal interference by providing a decentralized network that is resistant to tampering. It will improve the security of communication networks and provide transparent and immutable records for data exchange. Moreover, blockchain helps in efficient spectrum management because of the automation of processes and dynamic spectrum sharing to optimize resource usage and risk of interference. This is despite the fact that application in these domains comes not

without a host of challenges, including scalability, high energy consumption, and regulatory concerns. Realizing the full potential of blockchain, therefore, requires solutions to these issues, be they sharding, energy-efficient consensus mechanisms, or robust regulatory frameworks.

It is expected that with exponential development in technology, blockchain will turn out to be one of the most essential building blocks for satellite communication systems and space exploration. This is because of its capacity to offer better, safer, and more efficient solutions that meet the requirements of modern space missions and communication networks. Thus, the present research brings out an urgent requirement in continued exploration and refinement of blockchain applications to harness its transformative power for the future in space technology.

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Legal Oversight of Foreign Technology Companies: Effectiveness and Challenges



Yasar Alhiniti and Khalif Saleh Dhiab Amoush

Abstract This chapter discusses the legal obligations placed on foreign technology providers by local laws. It tries to show how such obligations affect the day-to-day activities and dealings of these companies within the target country and examines the efficacy of governmental oversight in enforcing compliance. The analysis used carefully selected legal texts applied to model situations, enriched by reference to current legal literature and related earlier research. Recommendations resulting from this study emphasize the need for strict observance of these legal obligations for protecting the national economy and upholding the rights of individuals engaged in business with foreign technology providers. Moreover, it strongly brings out a necessity to make revisions in certain legislation to bring them up to date with advances taking place in technology and rapid economic development.

Keywords Foreign technology companies · Legal obligations · Compliance · Legal oversight · National economy · Local legislation

1 Introduction

When foreign companies are recognized as having legal personality, they are granted certain rights and are also obligated to fulfill specific requirements. This recognition has various effects, some of which are automatically conferred by law, while others come into play once the companies complete the necessary registration procedures and begin operating within the country [1]. The legal basis for this recognition is the Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions, which was signed on June 1, 1956, during the International Private Law Conference held in The Hague in 1951. According to Article 7

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of the Convention, the recognition of a company's legal personality does not imply automatic approval for its operations or activities within the recognizing state's territory. Instead, the company's freedom to operate remains subject to the laws of the host country [2].

In addition, when a foreign company is acknowledged as having legal personality, it is endowed with a series of entitlements that have been globally acknowledged in the Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions, particularly in Article 1. These entitlements encompass, at the very least, the ability to engage in legal proceedings, the ownership of assets, the execution of legal transactions, and the utilization of public amenities [3].

In light of the lack of explicit explanations for the termination of foreign companies in accordance with Jordanian laws, the researcher has chosen to investigate the regulatory provisions that govern foreign companies in Jordanian legislation, as well as the methods for resolving disputes that arise in relation to the operations of foreign companies in the country.

1.1 Study Methodology

The methodology employed in this study is descriptive-analytical in nature. The primary focus was on examining and evaluating the legal documents pertaining to the responsibilities of foreign corporations that operate within Jordan, as outlined in Jordanian Companies Law No. 22 of 1997. The collection of data was conducted using authoritative legal sources, such as laws, regulations, and directives issued by relevant governing bodies, as well as through consultation of legal literature and previous research conducted on the subject matter.

1.2 Study Objectives

This study aims to achieve the following:

- Identify the obligations of foreign companies operating in Jordan under the Jordanian Companies Act No. 22 of 1997 and understand the legal basis for these obligations.
- Analyze legal texts regarding the obligations of foreign companies and compare them with similar regulations in other countries to determine their compatibility and effectiveness in protecting rights and ensuring transparency.
- Assess the impact of compliance with legal obligations on the performance of foreign companies operating in Jordan and on the national economy as a whole.

2 Effects of Acquiring Legal Personality by Foreign Companies

Granting foreign companies legal recognition [4] ensures their ability to operate and manage their affairs within the borders of the host country, as long as they comply with the domestic laws of that country. This means that foreign companies can expand their operations beyond their home country, establishing branches and offices. However, they are also obligated to fulfill certain legal requirements. These obligations serve as a means for the host country to regulate and oversee the financial status of these companies, safeguarding the national economy and preventing undue dominance. Additionally, these measures protect domestic companies and individuals involved in transactions with these foreign companies from any potential malicious intent.

This section is structured into two distinct segments, drawing from the information presented above. The initial portion will delve into the privileges afforded to foreign companies that function within the framework of Jordanian legislation, while the subsequent segment will examine the responsibilities that foreign companies must uphold when operating under Jordanian law.

3 Rights of Foreign Companies

When a foreign company obtains legal personality, it is acknowledged to possess the same legal capacity as a natural or legal person. As a result, the company is bestowed with various rights and is obligated to fulfill certain responsibilities.

It is important to acknowledge that the origin of these rights and responsibilities stems from either international law, specifically the International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions, or the internal laws of the country where the foreign company operates, such as the Civil Code or the Jordanian Companies Law. The legal status of a foreign company ensures that it is entitled to a range of rights, some of which are automatically granted by law, while others are obtained through the registration process and the conduct of business activities within the host country. However, it is crucial for the company to adhere to its stated purpose and comply with the laws and public order of the host country in order to maintain these rights.

The International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions serves as the foundation for the rights afforded to these entities. These rights, as detailed in Articles (1, 4, 5, and 6), encompass various privileges such as the ability to engage in legal proceedings, conduct business transactions, possess property, and access public amenities [5]. However, it is important to note that these rights can only be conferred upon foreign companies by the laws of the country in which their headquarters are situated [6].

The first among the rights bestowed upon foreign companies is the right to engage in legal proceedings. As either a plaintiff or defendant, a foreign company possesses

the privilege of utilizing the national courts of the host country. This entitlement is a direct result of its acknowledgment as possessing legal personality, as explicitly stated in Articles 1, 5, and 6 of the International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions [7].

Disputes involving foreign companies, whether they are with individuals or other foreign parties, are dealt with by national courts. A ruling from the Jordanian Court of Cassation affirms that under Article 256 of the Jordanian Civil Code, any harm caused by a party, even if they are not competent, requires them to compensate for the damage. This applies regardless of whether the plaintiff is a foreign non-operational company. The fact that the plaintiff company is registered with the Companies Regulatory Official and has a commercial address further solidifies its standing. Consequently, the defendant company is obligated to provide compensation for the damages suffered by the plaintiff. The court emphasizes that there is no distinction between a foreign non-operational company and any Jordanian company in this regard [8].

It is important to recognize that the ability of a foreign company to engage in legal proceedings within a country's national courts is not without limitations. The jurisdiction of national courts over disputes involving foreign entities is governed by procedural rules [8]. Therefore, although foreign companies have a fundamental right to litigate, any constraint placed on this right is viewed as a violation of justice and a departure from established international legal principles [8].

With the decision made by the Jordanian legislature to allow foreign companies to access national courts, they have also given permission for these companies to be subjected to lawsuits in those same courts, as outlined in Article 27 of the Jordanian Civil Procedures Law No. 24 of 1988 [9]. This specific article establishes a universal principle that grants Jordanian courts the authority to handle any civil litigation brought against both Jordanian citizens and foreigners, encompassing both individuals and entities [10].

Lawsuits brought against individuals or entities from foreign countries who do not reside or have a legal presence in Jordan fall under the jurisdiction of national courts. However, if the foreign party has established a chosen residence or domicile within Jordan, which serves as a designated location for executing specific legal actions or receiving relevant judicial documents, this chosen domicile must be documented in writing. Furthermore, national courts hold jurisdiction in cases involving property situated in Jordan, bankruptcy proceedings initiated in the country, or if any of the defendants maintain a residence in Jordan, as outlined in Article 28 of the Jordanian Civil Procedures Law No. 24 of 1988 [11].

In its ruling, the Jordanian Court of Cassation upheld the notion that if a foreign company is registered with the Companies Regulatory Official at the Ministry of Industry and Trade as well as in the register of foreign companies and their branches, and if the city of Amman is deemed the legal domicile for non-operational foreign companies for litigation purposes under Article 245(c) of the Companies Law, then it follows that Amman is also considered the domicile for operational foreign companies for litigation purposes. Therefore, the claim that the Jordanian courts have jurisdiction to hear the case against the appellant, who is a registered foreign company conducting business in Jordan, is in accordance with the law. The court's decision

was justified and complied with the requirements outlined in Article 188/4 of the Civil Procedures Law [12].

As stated in Article 10/6 of the Jordanian Civil Procedures Law No. 24 of 1988, "in accordance with Article 241/A/4 of the Jordanian Companies Law No. 22 of 1997, companies with branches or agents in Jordan are obligated to designate a representative by proxy from the parent company. This representative, or their legally authorized substitute, or the agent themselves, will be the recipient of legal documents delivered either in person, at their place of work, or at their residence" [12]. The requirement for a proxy representative is outlined in the law as follows: "…a copy of the proxy authorizing the foreign company to appoint a resident in the Jordan to manage its affairs and receive notifications on its behalf" [13].

Foreign companies are afforded the privilege of participating in lawful dealings. The acknowledgment of the legal identity of foreign companies bestows upon them the entitlement to engage in legal transactions, as confirmed by Article 1 of the International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions. This article stipulates that foreign companies possess, at the very least, the ability to engage in litigation, own assets, enter into contracts, and partake in various other legal transactions [13].

According to the definition, a legal transaction encompasses the intention to produce a legal consequence, whether it involves establishing, transferring, modifying, or terminating a right [14]. In line with Article 241/1/4 of the Jordanian Companies Law No. 22 of 1997, a foreign company has the ability to engage in various legal transactions, including sales, leases, gifts, and barter, through its agent or legal representative in the Kingdom. However, these transactions must align with the company's purpose, comply with the laws, public order, and morals of the host country, and not be prohibited or restricted by the legislation of the parent company's home country [15].

Enabling foreign companies to participate in lawful transactions is crucial for the advancement of the domestic economy and the promotion of investment. In an effort to attract more investment to Jordan and bolster the national economy, the Jordanian legislature has eliminated certain limitations that were previously imposed on foreign companies, including restrictions on non-Jordanians owning both movable and immovable assets. This favorable treatment allows these companies to engage in various legal activities, such as procuring raw materials and acquiring properties for the purpose of establishing economic ventures [16].

National and foreign companies alike possess the same entitlement to utilize public utilities, as long as they fulfill their financial obligations in the form of fees and taxes [17]. They have the right to access transportation services and enjoy the benefits of electricity, water, roads, and various other services. This privilege is explicitly stated in Articles 1 and 6 of the International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions [18].

The International Convention on the Recognition of the Legal Personality of Foreign Companies, Associations, and Institutions states that foreign companies have the right to own both movable and immovable property. This convention defines a public utility as any activity conducted by the government, either directly or through

individuals under its supervision, with the purpose of meeting public needs and utilizing certain privileges of public authority [19].

However, the ownership of property by foreign companies is heavily regulated under Jordanian legislation, with strict limitations imposed on them. These limitations restrict foreign companies to only use the property for the specific purpose for which they were established, a legal principle known as the "Principle of Specialization." This principle is outlined in Article 51/2/b of the Jordanian Civil Code No. 43 of 1976, which states that foreign companies can only exercise their capacity within the boundaries set by their establishment document or as prescribed by law [20]. Furthermore, Article 5 of the Law on the Disposal of Immovable Property by Legal Persons No. 61 of 1953 allows industrial, commercial, and financial companies registered within the Kingdom but established abroad to own immovable property to the extent necessary for their operations, subject to the approval of the Council of Ministers [21].

As per the provisions of Article 5/A of the Jordanian Investment Environment Law No. 21 of 2022, investors are bestowed with the privilege of engaging in any economic activity through complete ownership, participation, or contribution, except for activities that are regulated. This law ensures that both Jordanian and non-Jordanian investors are granted equal rights and privileges, and are treated fairly, transparently, and equitably. The fair and equitable treatment of all investors, regardless of their nationality, is emphasized in paragraph A of Article 3, which mandates equal treatment in terms of rights, privileges, and obligations.

The Law on Leasing and Selling Immovable Property to Non-Jordanians and Legal Entities No. 47 of 2006, upon examination, initially establishes equality between Jordanian and non-Jordanian legal entities in terms of owning immovable property. This is outlined in Article 2, which defines a legal entity as "a person who is granted legal personality under the legislation of the state in which it is established and registered, whether Jordanian or foreign". The law distinguishes between two scenarios regarding the ownership of immovable property by legal entities. The first scenario pertains to property ownership within specific boundaries, allowing for land ownership within these limits as required for the establishment of a project, subject to the approval of the Minister of Finance and the recommendation of the Director of the Department of Lands and Survey, provided that the area does not exceed 30 km^2. If the area exceeds thirty km^2, the approval of the Council of Ministers and the recommendation of the Minister of Finance are required, as stated in Article 10 of the same law [22].

The second scenario pertains to land that falls outside the confines of an organization. According to the law, individuals are permitted to own land for the sole purpose of establishing an investment project, granted that it does not exceed fifty km^2. In such cases, approval from the Minister of Finance, upon the recommendation of the Director of the Department of Lands and Survey, is required [22, 23]. Additionally, consultation with the relevant authority is necessary. However, if the land area surpasses fifty km^2, the approval of the Council of Ministers is mandatory. This approval must be based on the recommendation of the Minister of Finance and

after consulting with the relevant authority, as outlined in Article 11 of the same law [22, 24].

The legislator has clearly outlined the powers of the Council of Ministers and the Minister of Finance in approving the ownership of immovable property by foreign companies within and outside organizational boundaries. This approval is granted on the condition that these companies have the necessary legal status as specified in Article 4 of the Jordanian Companies Law No. 22 of 1997. Such provisions enable these companies to effectively conduct their intended operations.

In accordance with Article 16/A of the same legislation, foreign companies that have been established specifically for the purpose of conducting economic activities within industrial cities have the privilege of owning up to fifty km^2 of land without seeking approval from the Council of Ministers or the Minister of Finance. Instead, they are only required to complete registration procedures with the Department of Lands and Survey [25]. In order to promote investment and attract foreign capital, the legislature has implemented new economic policies centered around privatization. Foreign companies are now allowed to lease land that exceeds ten km^2, granted that they obtain approval from the Minister of Interior or their representative. Additionally, the lease term must surpass three years, and the lease agreements must be documented in accordance with the instructions provided by the minister [26], as outlined in Article 12 of the Law on Leasing and Selling Immovable Property to Non-Jordanians and Legal Entities No. 47 of 2006 [27].

Article 13/A/1 of the Jordanian Investment Environment Law No. 21 of 2022 offers incentives, exemptions, and advantages to international corporations that lease state-owned land for economic purposes, as mentioned in the law [28].

In an effort to safeguard the national economy and promote investment, the Jordanian legislature has implemented certain measures to protect against potential risks associated with foreign ownership of immovable property. While foreign companies are allowed to own property both within and outside organizational boundaries, there are specific conditions that must be met. For residential or commercial purposes, the company must complete their project within a three-year timeframe, while other purposes require completion within five years. In certain cases, the period may be extended for an additional three years, subject to the recommendation of the Director of the Department of Lands and Survey and the approval of the Minister of Finance. Failure to meet the designated timeframe will result in an annual fine of 5% of the property's market value, as determined by the Director of the Department of Lands and Survey, for a maximum period of ten years. If the foreign company does not sell the property, it will be publicly auctioned with the proceeds going to the owner, as stipulated in Article 13 of the Law on Leasing and Selling Immovable Property to Non-Jordanians and Legal Entities No. 47 of 2006 [29].

Foreign operating companies face additional limitations, as dictated by the Jordanian legislature. One such restriction is the prohibition on transferring immovable property until a specific time has passed since its acquisition. However, there is an exception to this rule if the purpose of the acquisition is to establish a residential or commercial project and the company has already begun the project. This provision

can be found in Article 14 of the Law on Leasing and Selling Immovable Property to Non-Jordanians and Legal Entities No. 47 of 2006.

In terms of the legal rights of foreign operating companies according to Egyptian law, these companies are acknowledged as having their own legal identity by the Egyptian legislator. This recognition grants them the ability to engage in legal proceedings, utilize public facilities, and conduct general legal transactions, as long as they have been properly established in the country where their primary headquarters is located. The Investment Incentives and Guarantees Law No. 72 of 2017 ensures that foreign investors are treated fairly and equally, receiving similar treatment to domestic investors. Additionally, in certain situations, foreign investors may even receive preferential treatment over domestic investors, as determined by the Council of Ministers [30].

Foreign operating companies have the right to engage in legal proceedings in Egyptian courts, regardless of whether they are the plaintiffs or defendants. This is established in Article 11/2 of the Egyptian Civil Code No. 131 of 1949, which explicitly states that the legal framework for foreign legal entities, including companies, associations, and institutions, is determined by the laws of the country where their primary management is located. However, if these entities conduct their primary operations within Egypt, then Egyptian law takes precedence. Consequently, foreign operating companies are able to pursue litigation in Egyptian courts.

The establishment of international jurisdiction in Egyptian courts to handle lawsuits against foreign operating companies is outlined in Articles 29, 30, and 32 of the Egyptian Code of Civil and Commercial Procedure No. 13 of 1968. This provision ensures that foreign operating companies can be held accountable in Egyptian courts.

Through the establishment of a branch in Egypt, foreign operating companies are granted legal personality, enabling them to participate in various legal transactions such as selling, leasing, and gifting. These companies are also entitled to utilize public utilities like water, electricity, and roads, on the condition that they fulfill their financial obligations in terms of fees and taxes. The rights bestowed upon foreign companies stem from both domestic legislation and international law, which mandates that countries must guarantee foreigners a minimum level of rights as outlined in international treaties and customary practices.

In order to promote investment and stimulate economic growth, the Egyptian legislator has implemented new policies that allow foreign operating companies to possess real estate and vacant land. This permission is granted under Law No. 230 of 1996, with certain stipulations that must be met:

1. Ownership is limited to a maximum of two properties throughout the country intended for private residential purposes for the owner and his family, without prejudice to the right of ownership of the property necessary to carry out the licensed activity granted by the competent authorities in the country.
2. The area of each property must not exceed 4000 m^2 and the total area must not exceed 8000 m^2, as having more than that is considered excessive.

3. The property cannot be classified as an archaeological site within the meaning of the Monument Protection Act No. 117 of 1983 [31].

The significance of foreign operating companies in bolstering the national economy and the acknowledgement of foreigners' rights, both domestically and internationally, are the underlying reasons behind the rights bestowed upon them by legislators in Jordan and Egypt, according to the researcher. These rights serve as the basic prerequisites for foreign operating companies to carry out their business and operations within the host country. It would be illogical to grant a foreign operating company the required permit to operate in the host country, only to restrict its access to public amenities, impede its access to national courts, or deny its ownership of the essential property needed for the establishment of its commercial venture.

Duties of Foreign Operating Companies.

When a foreign operating company obtains legal personality, it is bestowed with specific rights that naturally accompany this status. However, with these rights come a set of obligations that the company must adhere to while conducting business in Jordan, as failure to do so may result in deregistration.

In order to closely monitor foreign operating companies and safeguard the national economy, the legislator has implemented these duties that grant authority to the minister or the General Regulatory Official of Companies. This measure aims to ensure the financial and legal status of these companies and protect those who engage in business with them, recognizing the significant impact they have on the country's economy.

The Jordanian legislator has addressed these duties in Articles 242, 243, and 244 of the Jordanian Companies Law No. 22 of 1997. The researcher will cover the duties of foreign operating companies as follows [32–35]:

- A branch of a foreign company operating in Jordan is obliged to disclose in its official documents and correspondence the name of the foreign parent company, its nationality, legal form, address, capital in the home state and in Jordan and the registration number of its branch company with a controller [36–38].
- Submit the balance sheet and profit and loss account to the General Regulatory Official of Companies within three months of the end of each financial year [39-42].
- Publish the balance sheet and profit and loss account in at least two local newspapers within sixty days of delivery of these documents to the administrator [29–31].
- Make the company's books and documents available to the General Regulatory Official of Companies [27, 28].
- Notify the administrator in writing of the date you will cease operations or the expected date you will cease operations in Jordan.
- Prove settlement of all obligations arising from activities in Jordan.

In the opinion of the researcher, it is necessary for the legislator to enforce more severe sanctions on foreign operating companies that do not comply with the obligations set forth in this legislation. The researcher expresses the desire for the legislator to include a specific legal provision within Chapter Twelve of the Jordanian Companies Law No. 22 of 1997, outlining appropriate penalties for foreign operating companies that fail to meet their obligations. This is because the current penalty stated in Article 282 of the same law does not adequately address the seriousness of this violation.

In Egyptian Law.

According to the executive regulations of the Egyptian Companies Law, it is mandatory for branches of foreign companies to inform the Companies Authority within three months after the end of the financial year. This notification must include a copy of the financial statements, the auditor's report, and comprehensive details regarding the directors, such as their nationalities, number of employees, roles, nationalities, salaries, and share of profits. Furthermore, the General Regulatory Official of Companies must be informed about the parent foreign company, including its name, nationality, legal form, main address, purpose, capital, registration number, and address. It is also required for the branch to advertise this information within their offices. In addition to these obligations, the branch must allow the Companies Authority to inspect their books and provide any necessary clarifications or documents [33].

In the event that a court decision alters the legal standing of the foreign operating company, such as bankruptcy or dissolution, the company is required to submit a copy of the ruling to the registry office within a three-week timeframe. If the ruling originates from a court outside of Egypt, it must be enforced by an Egyptian court and officially communicated to the commercial registry in order to update the company's information in the commercial register [34].

4 Conclusion

The analysis presented in this study encompasses a thorough examination of the legal obligations that foreign operating companies must adhere to in Jordan, as stipulated by the Jordanian Companies Law No. 22 of 1997. The study delves into the significance of these companies in bolstering the national economy and the challenges they encounter when striving to comply with legal mandates. Furthermore, practical recommendations have been put forth to enhance the legal and regulatory framework governing these companies, with the ultimate goal of attracting greater foreign investment and fostering stakeholder confidence. It is anticipated that this study will contribute to the formulation of policies and legislation that strike a harmonious balance between effective oversight and support for sustainable economic growth in Jordan.

4.1 Findings

Following the study of the duties of foreign operating companies under Jordanian legislation, the study reached several key findings summarized as follows:

1. Foreign operating companies in Jordan are required to disclose their basic data in their official documents, which enhances transparency and ensures that stakeholders are informed of all legal and financial details.
2. Foreign companies must submit a detailed annual financial statement to the General Regulatory Official of Companies, which helps ensure effective oversight of their activities and adherence to financial standards.
3. Foreign companies are required to publish their financial statements and profit and loss accounts in local newspapers, ensuring that financial information is accessible to the public and stakeholders.
4. Foreign companies must make their books and documents available to the General Regulatory Official of Companies, which enhances the controller's ability to perform their oversight role effectively.
5. Foreign companies must notify the controller in writing of the expected date of their cessation of operations in Jordan, to protect the rights of those dealing with them and ensure proper settlement of all obligations.

4.2 Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance the enforcement of duties for foreign companies in Jordan:

1. Update laws to include electronic publication of financial statements and reports in addition to publication in local newspapers, aligning with technological advancements and ease of access to information online.
2. Increase penalties for foreign companies that fail to fulfill their legal duties, to ensure full compliance and effective oversight.
3. Strengthen the role of the General Regulatory Official of Companies and provide necessary resources for effective performance, including ongoing training and the use of modern technology in oversight processes.

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A Novel Model for Crop Disease Detection Using CNN



G. Komarasamy, R. Ganeshan, Murad Zeer, and Maram Y. Al-Safarini

Abstract This study aims to explore the convergence between an AI-Powered Retina-Based Diagnostic Tool and state-of-the-art deep learning models that can pave the way for early identification of the risk of cardiovascular disease (CVD). A critical review was conducted using 30 studies that demonstrated the impressive potential of deep learning methodologies with an ability to extract the risk factors pertaining to CVD from retinal images. These methodologies acquire tracking retinal-vessel characteristics with remarkable accuracy, revealing rich signs of CVD risk factors. The pioneering AI algorithm, born out of this research and precise calculation of retinal vasculature from retinal images, has leaped a giant step forward of fusing retinal vasculature imaging with traditional risk factors—a breakthrough prediction model for predicting cardiovascular events. Whether strategizing ways to standardize methodologies across studies or creatively merging AI-enabled retinal imaging with traditional risk through the integration of AI-enabled retinal imaging with traditional risk factor, the study underlines the accelerating pace at power of integrating of AI into clinical practice. According to the World Health Organization, 17.9 million people die of CVDs annually—an estimated 31% of all deaths worldwide. The medical and social costs of their widespread prevalence—and the increasingly longer lifespans of

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many people residing in advanced economies—underscore the need for new, more effective diagnostic strategies to manage these conditions and reduce their impact.

Keywords Cardiovascular disease prediction · Retinal imaging · AI · Machine learning · Deep learning · Early detection · Technological progress

1 Introduction

Agriculture is very important in India's economic development and the need for efficient methods to protect crops and enhance food production. Challenges include the identification and monitoring of crop diseases, However, the selection of the right classification algorithm for different data types remains a challenge, which can lead to low production and economic losses. The objectives detail the goals of detecting leaf diseases, extracting relevant features, and comparing machine learning algorithms for classification. The introduction provides context on the importance of agriculture and challenges in crop disease detection.

Literature work reviews existing research and identifies gaps the current study aims to address. Existing work outlines prior methods and techniques in plant disease detection, while the proposed work introduces innovative methodologies and potential impacts. The overall architecture and flow diagram visualize the system's structure and process. The software and hardware used section lists the tools and resources utilized in the research. Experimental results present the outcomes and comparisons of different algorithms, including charts and tables. The conclusion summarizes key findings and suggests potential areas for future research. References provide sources cited, and the contribution of all members acknowledges each team member's role in the research.

2 Literature Survey

Shruthi et al. presented the stages of general plant diseases detection system and study of machine learning techniques for plant disease detection. They showed that a convolutional neural network (CNN) detects many diseases with high accuracy [1]. P. Srinivasan et al. developed the software to classify and categorize groundnut leaf diseases. In their approach, groundnut crop disease such as Early leaf spot, Late leaf spot, Rust, early and late spot Bud Necrosis were categorized only 4 dissimilar disease using image acquisition, image preprocessing, segmentation, feature extraction, and the K Nearest Neighbor (KNN) [2]. L. Sherly reviewed of various types of plant diseases and different classification techniques in machine learning that are used for identifying diseases in different plant leaves along with the pros and cons. This paper summarized different algorithms used for classifying and detecting bacterial, fungal and viral plant leaf diseases [3]. Gurleen Kaur et al. reviewed the methods of

plant leaves disease detection the major techniques employed were: BPNN, SVM, K-means clustering, Otsu's algorithm, CCM and SGDM for image segmentation, feature extraction, and classification [4]. Md. Selim et al. used eleven statistical features and the Support Vector Machine classifier (SVM) to recognize the diseases. The advantages of this increase the efficiency of the detection, identification, and classification process. It gives 93% accurate results in disease classification [5]. Monzurul Islam et al. integrated image processing and machine learning to allow diagnosing diseases from leaf images of potato plants. It gave 95% of the accuracy of disease classification using Color thresholder, GLCM and multiclass SVM [6]. Jobin Francis et al. calculated damaged ratio of leaf for the identification of leaf diseases in pepper plants. Masking and threshold based segmentation carried out to separate leaf from background. Using back propagation algorithms two types of diseases were identified [7]. Vijai Singh et al. used genetic algorithm for leaf image segmentation. The advantages of this method are that the plant diseases can be identified at an early stage or the initial stage, and with minimal computational efforts and the optimum results [8]. Mrunmayee et al. describe methods of an image processing and neural network for disease detection and classification. The color images preprocessed, and for segmentation, k-means clustering is used. The texture features are extracted using a gray level co-occurrence matrix (GLCM) method and given to the artificial neural network. The overall accuracy of this method is 90% [9]. Sachin D. Khirade et al. discussed segmentation and feature extraction algorithm used in plant disease detection. For classification of disease in plants neural network methods such as self-organizing feature maps, backpropagation algorithms, SVMs, etc. were proposed [10]. Usama Mokhtar et al. used an color space transformation and gray-level co-occurrence matrix (GLCM) for preprocessing and feature extraction respectively. Support Vector Machine (SVM) algorithm with different kernel functions is used for the classification phase. The result shows that the classification accuracy is 99.83% [11]. Melike Sardogan et al. presented a Convolutional Neural Network (CNN) model on three different input matrices have been obtained for R, G and B channels to start convolution for every image in the dataset. ReLU activation function and max pooling have been implied to the output matrix and Learning Vector Quantization (LVQ) algorithm used for four types of tomato leaf disease detection and classification [12].

3 Methodology

Image acquisition is the first step of a plant disease detection system is shown in Fig. 1. By using digital cameras, scanners, or drones, high-quality plant images can be captured. The images can also be taken from the web. Large numbers of image samples were collected from Kaggle datasets, which consist of diseased and healthy leaves. Image Preprocessing is used to increase the quality of leaf image and eliminate unwanted noise. The segmentation process is used to partition the plant image in various segments to separate the diseased portion of the leaf [13–19].

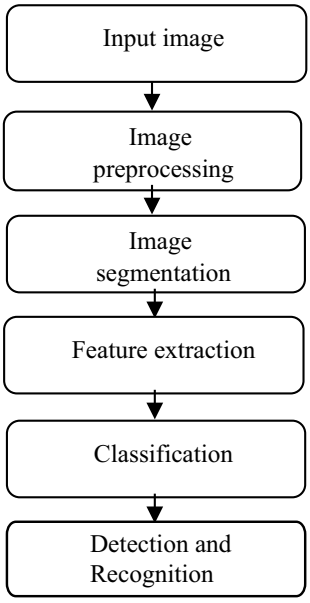


Fig. 1 Plant disease detection system

Plant disease classification is performed using machine learning techniques such as Support Vector Machine (SVM) and Convolutional Neural Network (CNN). SVM is a supervised classifier that efficiently handles high-dimensional data and identifies a hyper-plane to separate classes. CNN, on the other hand, is a deep neural network composed of various layers such as input, convolution, pooling, fully connected, and output layers. It is used to classify plant diseases from images by extracting and processing features. The combination of these methods allows for effective classification and identification of plant health.

Multi-class Classification

Plant disease datasets contain images of both healthy and infected plant samples, each associated with a specific class. For example, images of banana plants, whether healthy or infected, are categorized under the banana plant class. In multi-class classification, each image is classified into one of several distinct categories within a class, such as xanthomonas wilt, fusarium wilt, bunchy top virus, and black sigatoka for banana plants. In contrast, multi-label classification treats each category within a class as a separate class. For instance, if there are N classes, each with M categories, then each category within every class is considered an individual class, allowing for more nuanced classification where multiple categories can be assigned to a single image.

Transfer Learning Approach

Training state-of-the-art models typically takes days or weeks, even on high-end GPUs. For example, a CNN model built from scratch achieved 25% accuracy in

200 epochs, while a pre-trained CNN model using transfer learning reached 63% accuracy in about 100 epochs. Transfer learning, which involves various approaches based on pre-trained networks, offers a more efficient solution for model training.

ResNe-50

ResNet-50 is a convolutional neural network with 50 layers, organized into five stages featuring convolution and identity blocks. It introduces the concept of residual learning, where convolutional layers are stacked and skip connections are used to bypass the input directly to the output. These skip connections help address the vanishing gradient problem, allowing for deeper networks by ensuring gradients flow more effectively through the layers. This architecture improves the network's performance and accuracy in computer vision tasks.

Let us consider x as the input image, F(x) as the nonlinear layers fitting mappings, and H(x) as the residual mapping. Thus, the function for residual mapping becomes.

$$H(x) = F(x) + x \tag{1}$$

VGG-16

The VGG-16 network model, also known as the Very Deep Convolutional Network for Large-Scale Image Recognition, was built by the Visual Geometry Group from Oxford University. The depth is pushed to 16–19 weight layers and 138 M trainable parameters. The depth of the model is also expanded by reducing the convolution filter size to 3×3. This model requires more training time and occupies more disk space.

DenseNet-121

DenseNet-121 is a deep CNN model is shown in Fig. 2, designed for image classification using dense layers with shorter connections between them. In this network, each layer receives additional inputs from its preceding layers and passes its generated feature maps to the succeeding layer. Concatenation is performed between each layer, through which the next successive layer receives collective knowledge from all the preceding layers. Further, the network is thin and small since the preceding layers' feature maps are mapped to the subsequent layers.

$$Y = W_3\{x, h_1(x), h_2(x), h_3(x)\} \tag{2}$$

Inception V4

Images contain lots of details and salient features and may vary in size. With these variations in size, choosing the right filter size for feature extraction is challenging. For local information extraction, a smaller kernel size should be chosen, whereas, for global information, the kernel size should be large. Stacking up the convolution layers may result in overfitting and vanishing gradient problems. To solve this, the Inception modules incorporate different kernel sizes in each block, such that the

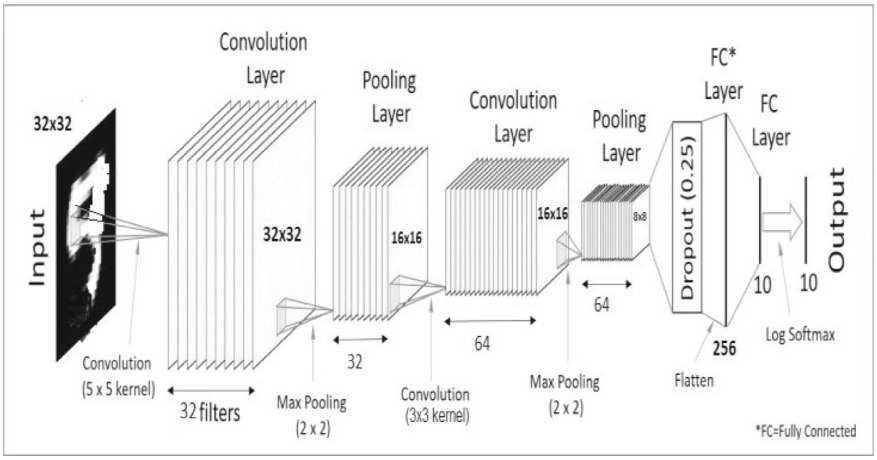


Fig. 2 CNN

network model becomes wider instead of deeper. For instance, the naïve Inception module can use 3×3, 1×1, or 5×5 sizes for the filter after three different stages of convolution. Max-pooling is then performed and the outcome is concatenated and passed to the next layer. The stem of the Inception layer is meant for setting up an initial set of operations to be performed before the Inception module. Further, Inception V4 has reduction blocks to alter the height and width of the grids.

Feature Extraction

The extraction of color, shape, and texture feature of the diseased part of the plant can be done using a grey level co-occurrence matrix (GLCM). There are different techniques of feature extraction that can be employed for growing the system such as gray-level co-occurrence matrix (GLCM), spatial grey-level dependence matrix, color co-occurrence method, and histogram-based feature extraction. The GLCM method is a statistical method for texture classification. In this work, we extracted 6 features (color and textural) from every leaf image of the dataset. The Gray Level Co-occurrence Matrix (GLCM) was used for extracting statistical texture features like contrast, energy, and homogeneity. Besides, numerical indicators like mean, standard deviation, entropy are calculated.

Some notations—$g_{ij} = (i, j)^{th}$ entry in GLCM.

L−1 = number of distinct gray levels.

Contrast—It measures spatial frequency. It is the difference between the highest and lowest values of an adjacent set of $\sum_{\mathrm{i}} \sum_{\mathrm{j}} (\alpha - \mathrm{i})^2 g_{\mathrm{ij}}$.

Energy- Measures the textural uniformity. It reaches a maximum value when the gray level distribution has the same form. It is given by

$$\sum_{\mathrm{i}} \sum_{\mathrm{j}} \mathrm{g}_{\mathrm{ij}}^2$$

Homogeneity—It passes the value that calculates the tightness of the distribution of the elements in the GLCM. It is given by

$$\sum_{i}\sum_{j} 1/\left(1+(\alpha-i)^2 g_{ij}\right)$$

Entropy measures the disorder or complexity in the image. It is large when the image is not texturally uniform and GLCM features have very small values. Entropy is given by

$$\sum_{i=0}^{1-1} P(g(i))\log_2 P(g(i))$$

Support Victor Machine (SVM) Classifier

For plant disease classification, the Support Vector Machine (SVM) classifier is employed due to its advantages, such as effectiveness in high-dimensional spaces and memory efficiency, as it uses only a subset of training points called support vectors. SVM is a supervised machine learning algorithm used for both classification and regression. It works by plotting data points in an n-dimensional space and finding a hyper-plane that best separates different classes of data. This hyper-plane allows for accurate classification by distinguishing between healthy and diseased plant samples (Fig. 3).

Convolutional Neural Network (CNN)

Convolutional Neural Networks (CNNs) are deep neural networks used for image classification. The model consists of an input layer, convolutional layers for feature extraction, pooling layers to reduce dimensionality, and a fully connected layer that consolidates features into a single vector. The output layer then classifies the plant disease based on the extracted features. Table 1 demonstrates the model performance of CNNs.

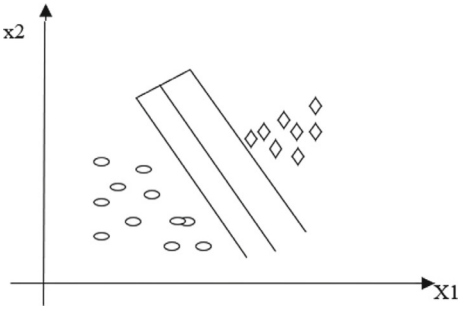


Fig. 3 Support vector machine

Table 1 Model performance of convolutional neural networks (CNNs)

Crop focus	Disease addressed	Dataset	Classes	Model	Model performance
Several	Citrus canker, black mould, bacterial blight, etc.	Plant disease symptoms database	12 56 diseases under 12 classes	CNN GoogLeNet with tenfold cross-validation	Accuracy
Several	Black rot, late blight, early blight	Self-collected database	527 species of diseases under 5 classes	CNN	Accuracy 96.5%
Tomato plant	Various diseases and pests in tomato plant	Self-generated database	9	Faster region-based CNN with SSD 1 and region-based fully convolutional network	Precision: 85.98%
Several	Powdery mildew, early and late blights, cucumber mosaic, downy mildew, etc	Open dataset	58	CNN with pre-trained VGG network	Accuracy: 99.53%
Several	Black rot, late blight, early blight	PlantVillage	38	VGG-16, Inception V4, ResNet with 50, 101, and 152 layers, and DenseNet with 121 layers	Accuracy: 99.75%
Apple	Apple scab, apple grey spot, general and serious cedar apple rust, serious apple scab	AI-challenger plant disease recognition	6	DenseNet-121	Accuracy: 93.71%
Tomato	ToMV, leaf mold fungus, powdery mildew, blight	AI-challenger plant disease recognition	4	Faster regional CNN	Accuracy
Several	Rice leaf smut, maize common rust, maize eyespot, rice bacterial leaf streak	Public database	7	Pre-trained models	Accuracy: 92%

4 Experiments

For SVM, 52 images are taken from open source. In that 37 images are used for training and 15 images are used for testing. SVM detects whether a leaf is healthy or infected. For CNN, the source of data is collected from the Kaggle website i.e. "new plant diseases dataset". From that dataset 12,949 images are used for training. Image dataset containing healthy and unhealthy crop leaves such as apple, cherry, corn (maize), grape, peach, pepper bell, potato, strawberry, tomato, etc. The images thus collated are labeled with different categories of diseases and healthy (to differentiate healthy leaves from affected ones).

The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., "$A \cdot m^2$."

The results shows the result of the SVM classifier. The classification shows whether the plant leaf is infected or not. SVM gives 80% accuracy. The convolutional neural network (Alexnet) is experimented with to identify leaf diseases with an expectation of improved accuracy. The 80/20 splitting ratio is used to divide the database into two datasets i.e. training and testing. CNN detects leaf is healthy or diseased if so, it predicts the class of disease as well. CNN model was trained using the initial learning rate of 0.001 in 10 epochs. The overall accuracy for Apple leaves is 99%. The classification accuracy of respective plants is summarized in Table 1. The overall accuracy is found as 97.71%.

The second experiment evaluated the VGG-16 model using the same dataset. After standardization of the hyperparameters, the model was trained with 80% of the same dataset, with 10% used for testing and the remaining 10% of the image samples used for testing and validation. The analysis showed that the model recognition accuracy reached around 78% in the initial 10 epochs, after which is steadily increased to attain the maximum recognition accuracy of 84.27%, which was lower than the Inception V4 model. The training loss and the validation model were found to be 0.52% and 0.64%, respectively. The third experiment was undertaken with the ResNet-50 model. The same method was applied in the evaluation of model loss and recognition accuracy. This model achieved an accuracy of 99.83 and a model loss of 0.027. It outperformed the Inception V4 and VGG-16 models.

After hyperparameter standardization, the final experiment was executed with DenseNet-121, which has 121 layers with four dense blocks and a transition layer between each dense block. In the testing phase after training, the maximum accuracy achieved was 99.81% and the maximum validation loss calculated was 0.0154%.

In agricultural production, early diagnosis of crop disease is essential for high yields. To maintain a high production rate, the latest technologies should be implemented in the early diagnosis of plant disease. It was observed from the literature study that deep learning models are efficient in image classification, and transfer learning-based models are efficient in eliminating training complexity and huge dataset requirements. Hence, in this work, we evaluated four pre-trained models—VGG-16, ResNet-50, Inception V4, and DenseNet-121—to determine the model that

was best capable of classifying various plant diseases. The results for the pre-trained models were evaluated with evaluation metrics, such as specificity, sensitivity, and F1 score values. The validation accuracy in terms of the F1 score was calculated. It was inferred that DenseNet-121 outperformed the other network models and attained the highest validation peak with 0.998, which is very close to an F1 score of 1. In general, the value of an F1 score ranges from 0 to 1. A model's performance is relatively better when it is closer to 1. In our analysis, after repeating the same experiments for all the pre-trained models, we found that the highest validation accuracy in terms of the F1 score was achieved by DenseNet-121 at 0.998, whereas it was 0.887 for Inception V4, 0.901 for VGG-16, and 0.935 for ResNet-50.

A statistical representation of the pre-trained network models based on the evaluation metrics is shown in the Fig. 4. The vanishing gradient issues resulting from skip connections were eliminated using regularization techniques, such as batch normalization. With deeper models, various challenges, such as overfitting, covariant shifts, and training time complexity, occurred. To overcome these challenges in our experiments, we fine-tuned the hyperparameters. The experiments used sensitivity to predict the proportion of actually healthy plants classed as healthy (true positive) and actually healthy plants classed as unhealthy (false negative). From the evaluation, it was observed that ResNet-50 and DenseNet-121 performed better than the VGG-16 and Inception V4 models. A performance analysis of the different pre-trained models based on the specificity, sensitivity, and F1 score is shown in Fig. 4.

$$\begin{aligned} Sensitivity(recall) &= True\ Positive(True\ positive \\ &\quad + False\ Negative) sensitivity\ recall \\ &= True\ Positive + True\ positive \\ &\quad + False\ Negative \end{aligned} \tag{3}$$

The performance analysis of pre-trained models involves evaluating specificity, which measures the proportion of truly unhealthy plants correctly identified as unhealthy (true negatives) versus those incorrectly predicted as healthy (false positives). Comparing our results with state-of-the-art studies that used transfer learning on the PlantVillage dataset, our fine-tuned pre-trained model demonstrated superior performance by achieving the highest accuracy of 99.81%. This indicates that our model effectively handled a greater number of plant disease classes and outperformed existing approaches.

5 Conclusion

The primary objective of this study was to develop a robust plant disease detection system using machine learning techniques. The increasing need for early and accurate detection of plant diseases to ensure optimal agricultural production and minimize crop losses motivated this research. The study utilized advanced image processing

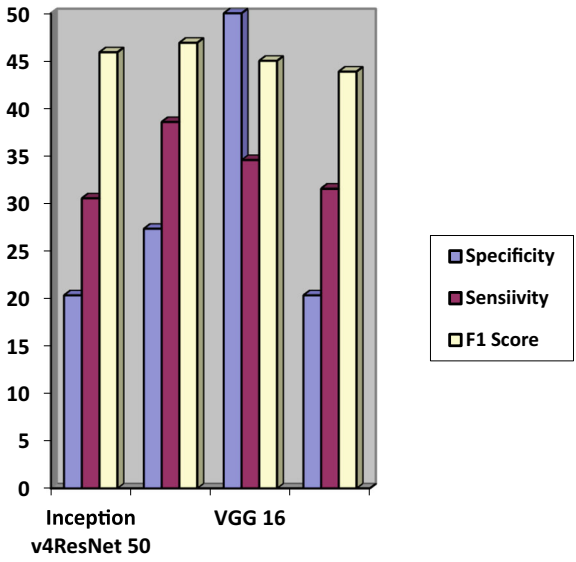


Fig. 4 Statistical representation of the pre-trained network models

and machine learning algorithms, specifically Support Vector Machine (SVM) and Convolutional Neural Network (CNN), to classify plant leaves as healthy or diseased based on their images.

Achievements

Efficient Disease Detection: The SVM classifier achieved an accuracy of 80%, while the CNN model (AlexNet) demonstrated a significant improvement with an accuracy of 97.71%. This indicates the effectiveness of machine learning algorithms in accurately detecting plant diseases from leaf images.

Comprehensive Dataset: A large dataset comprising over 12,949 images from various plant types was utilized, ensuring a diverse and representative sample for training and testing the models.

Feature-rich Analysis: The use of Gray Level Co-occurrence Matrix (GLCM) facilitated the extraction of comprehensive texture, color, and shape features, enhancing the accuracy and reliability of disease classification.

Future Enhancements

Transfer Learning: Implementing transfer learning techniques can further enhance the performance of the CNN model by leveraging pre-trained models and adapting them to the specific domain of plant disease detection.

Integration of IoT: Integrating Internet of Things (IoT) devices for real-time image capture and analysis can enable continuous monitoring of plant health, facilitating timely interventions and enhancing agricultural productivity.

Multi-class Classification: Expanding the classification system to identify specific types of diseases rather than just distinguishing between healthy and diseased leaves can provide more detailed insights and targeted solutions for disease management.

User-friendly Interface: Develop a user-friendly interface or mobile application to enable farmers and agricultural experts to easily capture and analyze plant images, interpret results, and receive timely recommendations for disease management.

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Influence of Behavioral Biases on Women Investor's Portfolio Performance



Mamatha S. Updayay, C. Nagadeepa, K. P. Jaheer Mukthar, and Hayel Khafajeh

Abstract This study aims to examine the impact of three behavioral biases—Herding, Anchoring, and Loss Aversion, on portfolio performance among women investors. Behavioral finance views financial decisions as often deviating from rationality due to psychological, cognitive or social factors. The effects of these biases on decision-making have been ranked by the study using Analytic Hierarchy Process (AHP). The data of 200 working women from diverse fields was collected through structured questionnaire and based on expert inputs, completing the feedback loop with these participants to give priority among biases using AHP technique. Based on the results, Herding Bias has significantly affected women investors in comparison to Loss Aversion and Anchoring Bias. The results have implications for policy related to the general public with regard to how social conformity, fear of loss and cognitive anchoring influence women in financial decision-making. The results of the study underscore the necessity for financial literacy to mediate between these biases in order to yield better decision outcomes. The findings of the study provides the knowledge of gendered tendencies in financial behavior, and also provide considerations to empower women breaking these stereotypes.

Keywords Behavioral biases · Women investors · Herding bias · Anchoring bias · Loss aversion

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1 Introduction

Over the last few years, female participation in financial markets has risen. As a woman have gained more control over their own finances, typically influenced by psychological factors that it is gaining traction as a focus area [1]. The field of behavioural finance underscores the behaviour of investors when they do not operate in a rational way, their behaviours being influenced by cognitive biases and emotions. Investors are completely unaware of these biases, which can lead to disastrous investment outcomes and could allow us not only fall victim to the usual retail investor biases but a whole heap more [2]. Yet, despite this widely-researched topic, the degree and manifestations of these biases on women investors has been largely unexplored. This is important to understand because of what we know about the different attitudes and behaviors in women compared with men when it comes to financial goals, risk preferences, and investment [3]. The main aim of the study is to look into the impact of behavioral biases like herding, anchoring and loss aversion on portfolio performance.

Herding Bias

The human trait of investors are to follow the lemming-like behaviour in making investment decisions, rather than thinking and acting independently on available information [4]. It depends on being slaved own group decision so they can feel safer but it leads to downfalls too when their collective opinion itself travels through the wrong path. For women investors, herding behavior could be a product of social networks and peer pressure or advice from trusted advisors such as friends, colleagues and financial experts.

Anchoring Bias

Anchoring bias is the tendency to rely on a previous reference point, which often includes their purchase price for that stock when it comes to making further decisions [5]. Women investors may be implicitly anchored to stock prices in the past or they think too much about specific financial goals, which can distort their assessment of current market conditions. This bias can result in a too fast or slow money movement strategy where women are more unwilling to sell when stock prices have not reached the desired value and thus, potentially holding profits back.

Loss Aversion Bias

Loss aversion is the behavioural bias that states human decision making will almost always be motivated and driven by a fear of losses rather than an equivalent prospect of gains [6]. Women display greater loss aversion than men and are traditionally more conservative investors, so heightened risk awareness may lead them to steer clear of a good deal on risky but lucrative investments. This can lead to a portfolio that is too safe—and may not perform well over time as a result. Not cutting losses on poor performing investments also dilutes portfolio returns due to loss aversion.

All of these biases; Herding, Anchoring, Loss Aversion etc. are indicators how the non rational factors move and determine financial behavior. Examining these biases in the case of women investors, this study forms part of a broader literature that tries to find answers regarding gender differences when it comes to investment decision making and performance. The way that the Analytic Hierarchy Process (AHP) was utilized for this study allows a quantitative ranking of these biases based on their relative impact with respect to women investment decision process.

Significance of the Study

The key of this research is aimed at female investors, still a smaller cited body compared to that in regular finance aligned studies. The growth of women as individual investors demands financial advice and strategies developed exclusively for them based on their specific behavior. This study attempts to explore the psychological factors of herding, anchoring, and loss aversion bias affecting womens portfolio performance. These biases are relevant to financial advisors and women investors—experts in the former can benefit easily. The insights can help advisors to create improved strategies that will dampen the influence of behavioral biases, in turn leading to better portfolio results. At the same time, women investors can understand better their own psychological biases affecting their investment decisions and be more informed as well balanced in investing.

2 Literature Review

This research investigates the effects of some behavioral biases on portfolio performance by examining different types of Herding Bias, Anchoring and Loss Aversion impacting women investors. Behavioral finance as a discipline attempts to comprehend and elucidates the instances where human beings act like unintelligent robotrons, which is exactly what traditional finance theories assume that we are; fully-rational investors who only operate on cold hard facts. The scientific literature from the fields of behavioral biases has established a solid base for enabling us to comprehend how psychological, cognitive and social aspects influence investment behavior specifically within female investors.

Investor Decision-Making and Behavioral Finance

The early theories in behavioral finance belong to scholars like Kahneman and Amos Tversky [7], who developed prospect theory which states that people evaluate losses and gains relative to a reference point, not from absolute terms. Their work showed that loss aversion is real (as buyers are more likely to buy a product at lower of risk—the here and now) than an expected return based on it; these gains would be achieved by gain-buyers). This idea has been extended to explain why investors tend to hang on my losing investments longer than they ought or refuse investment risk even though but for the potential payoff.

Similarly, Sahi [8] substantiated this area by gauging gender discrepancies in the way people invest. Men trade more, due to overconfidence In psychological and psychiatry research that looks into gender differences of behavior when it comes to risk taking: men tend generally show overconfident trades compares with women. In comparison, women are more risk-averse by nature which is good in some respect but can put a damper on their portfolio returns. There were other benefits to women's more conservative take on investing, the study also showed: The frequent trading by men often cut into their profits.

Herding Bias

Herding Bias is a proven financial market syndrome, in which people follow the rest of their crowd without any regard for even their own logic. For example, Shiller (2000) has argued that herding behavior heightens the risk of asset bubbles by inflating prices as new investors jump on board and driving them back down when they fade in favor. Herding may be especially relevant for women investors who make decisions within social networks and receive peer advice, the authors suggest. Research like that of Banerji et al. [9] demonstrates how the herding instinct in financial markets appears on both individual and institutional investors, generally due to fear-of-missing-out or social pressures rather than sound fundamentals.

Chohan and Kerckhoven [10] found that the presence of herding syndicates among retail investors leads to illogical investment behavior and market inefficiency. Market trends can be exaggerated-When a large number of market participants follow the same strategy and trade in the direction of certain trend, herding makes that movement even larger. Of particular interest in this study is the impact of herding on women investors—a topic important to MRIN because it wants to understand how social conformity or following-the-flock dependent their investment networks can make female retail traders.

Anchoring Bias

Anchoring Bias—This happens when investors pay too much attention to that first piece of information, the anchor (e.g. the price at which they originally bought a stock). This bias was observed by Andersson and Johansson, [11], in their groundbreaking research showing that people "anchor" on initial information, even when it has no bearing upon the event. Anchoring may cause judgement errors, as investors have a tendency to place much emphasis on previous prices and disregard new information or market conditions.

Owusu [12] investigated how anchoring influences investment behaviour amongst retail investors when stock markets experience bubbles or crashes. They unsurprisingly concluded that when a stock has become hyperinflated during a bubble, anchoring onto its top price caused investors to keep holding it long after the value had plummeted confusingly expecting it to return back up. This study aims to determine whether anchoring influences the decision-making processes of female investors, especially during times of high market volatility.

Loss Aversion Bias

Behavioral Finance is well researched area and in created out of it, we know the important concept—Loss aversion which comes from prospect theory. Investors are generally more averse to losing money than gaining the same amount, and therefore have risk-aversion as noted by Kahneman and Tversky [13]. This bias becomes especially important when assessing women investors as an ever-growing body of research suggests that they tend to be more risk-averse than men.

For instance, Dawson [14] found women to be more loss-averse than men—this often leads them to adopt less aggressive investment behaviours. As protective as this risk aversion is, it can actually lead to missing out on higher returns. Pushpa and Druvakumar [3] investigated the long-run survival of a losing stock trading in an experimental market and provide additional evidence. This research focuses on understanding how loss aversion reflects in the behavior of women investors especially when it comes to their portfolio management strategy.

Women Investors and Behavioral Biases

Over the last few years, there has been an increased focus on combining gender and behavioral biases this intersection. In short, researches show some gender differences in financial risk taking due to the fact that women are generally more cautious when investing rather than gambling or play game. It is discovered that in general, women trade less often than men which is related to their greater aversion of risk or the potential loss [15]. Still, reliance on such caution can depress portfolio returns if it manifests in conservative investment decisions. Further it is suggested that social biases from advice given to women can also affect investment behavior such as herding. A cross-sectional study of women investors has pointed towards the role of literacy and education in mitigating behavioral biases. This knowledge gap can impede women from making informed investment decisions which often result in suboptimal financial outcomes.

2.1 Objectives

The primary objective of this study is to identify, prioritize, and analyze the impact of various behavioral biases on women investors' portfolio decisions. Using the Analytic Hierarchy Process (AHP), the study aims to rank the relative importance of Herding Bias, Anchoring Bias, and Loss Aversion Bias and determine how these biases affect investment behaviors. The study seeks to provide insights that could inform the development of educational tools, interventions, or policies aimed at minimizing the negative impact of these biases on financial decision-making, specifically for women investors.

3 Methodology

This research is quantitative in nature and employs the Analytic Hierarchy Process (AHP) to evaluate the behavioural biases affecting portfolio decisions of women investors. The study samples 200 women of different investment experience and backgrounds across all industries. Study, developed a structured questionnaire for measuring the perceptions of respondents about three primary behavioral biases (Herding Bias, Anchoring Bias and Loss Aversion Bias). The questionnaire is composed of (1) demographic information and (2) pairwise comparisons, which encourage the respondent to reveal their assessment regarding how one bias outweighs another in making investment decisions. Biases are ranked by impact on portfolio selection according to pairwise comparison method. Participants also ranked their self-reported bias tendencies using a series of Likert-scale questions.

Pairwise comparison matrices for each bias were then constructed using the responses once the data was collected. The priority values (weights) of the biases were calculated using these matrices in AHP methodology. Once they had these revised word vectors, then that of the other documents was found as well by weighting them up in such way to made consistent comparisons Also consistency index (CI) and consistency ratio (CR) of the results was calculated to validate. Lastly, the study intended to finalize a set of results that could help in deriving meaningful conclusions linking portfolio performance with specific biases most prevalent among women investors and determine possible areas for targeted financial education or direct behavioral interventions.

4 Data Analysis

The demographic analysis of the study sample consists of 200 women investors from various fields, providing a diverse representation of the population. The respondents are categorized based on key demographic factors, including age, education, income, and investment experience. A significant portion of the respondents, approximately 40%, fall within the age range of 30–45 years, while 30% are between 46 and 60 years old. The remaining participants are younger than 30 or older than 60, with 20% and 10% respectively. In terms of education, the majority of respondents (60%) hold a bachelor's degree, while 25% have completed postgraduate studies, and the remaining 15% possess either a diploma or high school education. This wide range of educational backgrounds provides insights into how different levels of financial literacy may influence investment decisions.

Income levels and investment experience also play critical roles in shaping the behavioral tendencies of the participants. About 35% of the respondents earn between INR 5 lakhs and INR 10 lakhs annually, while 25% earn above INR 10 lakhs, indicating a significant portion of the sample possesses middle to upper-income profiles. The remaining 40% earn below INR 5 lakhs per annum, reflecting a more modest

income bracket. When it comes to investment experience, 45% of the women have less than 5 years of investment experience, while 35% have between 5 and 10 years, and 20% have over a decade of experience in the financial markets. This diverse demographic data enables the study to assess how factors such as age, education, income, and experience affect the presence and intensity of behavioral biases among women investors (Table 1).

The Analytic Hierarchy Process (AHP) is a method for making decisions of this type: it has proved to be very useful in cases where multiple criteria need consideration.

In order to make the AHP calculations we followed these steps:

Construction of the Pairwise Comparison Matrix: Using expert input, we constructed a pairwise comparison matrix to assess how one behavioral bias should be more important than other. Herding Bias was rated in comparison to Anchoring Bias, and Loss Aversion bias etc. for the rest encouraging scoring against all criteria. Every entry in the matrix indicates a ratio between biases.

Matrix normalization: At the end of pairwise comparison matrix was formed, then each cell element in its respective column had been divided to sum up with it as reducing whole values. Here, this is what (axis = 0) aggregates only in the row. Unsurprisingly they gives sum of itself to 1 per column.

Calculation of Priority Weights (w): The priority weights for each compared bias were calculated in the normalized matrix. Each of the weights is taken to represent a level importance that each bias has in making decisions. We did this by taking the average of each row in our normalised matrix. These priority weights (eigenvalues) were used to prioritize the biases.

Calculation of Weighted Sum Vector (Aw): Then you calculated the weighted sum vector (Aw) by multiplying matrix from step#1 with your priority weights. This step gives a vector that will be used to verify the consistency of judgements.

Consistency Check (Aw/w): The consistency ratio (CR) was calculated to maintain the relatedness in judgments. The first was division of the weighted sum vector by its correspondent priority weights (obtain a consistency vectors). The formula used to calculate the Consistency Index is given by;

Table 1 Significance of behavioral biases of women investors

Behavioural biases	Herding bias	Anchoring bias	Loss aversion bias	Priority value (w)	Weighted sum vector (Aw)	Aw/w
Herding bias	1.00	3.00	2.00	0.50	2.00	1.25
Anchoring bias	0.33	1.00	0.50	0.20	0.08	0.40
Loss aversion bias	0.50	2.00	1.00	0.25	3.00	0.90

Where, CI = λ max − n/n − 1

We also calculated the consistency ratio (CR) by dividing the Consistency Index to Random Consistency Index (RI), a standard value based on number of criteria. The CR in this study was computed to be less than 0.10, which suggests acceptable reliability on consistency A CR value lower 0.10 indicates that the judgements are consistent and the results reliable.

Ranking the Criteria: In this step, criteria were ranked according to their priority weights. The bias with the highest priority weight was identified as the most important driver behind women investors' decisions. In the example of this study, Herding Bias was given a higher weight than Loss Aversion and Anchoring Bias respectively which illustrate that women investors in the sample cared more about social conformity fear losing money versus being anchored to historical prices.

The highest priority value (0.56) suggests that herding bias is the most important factor explaining investment decisions among women investors, according to experts; This is further justified by its weighted sum vector value being 2.00. Value of loss aversion has priority value 0.33 which is showing the same important but less in contrast to herding. But has a bigger vector of weighted sum, indicating more influence than other conditions. Anchoring Bias: With the bottom priority value of 0.17, we can thus infer that experts view anchoring as having the least impact on their industry among these three biases.

Rank analysis: Based on the analysis of the AHP results, the ranks of the behavioral biases in terms of their influence on portfolio performance are as follows:

Herding Bias emerges as the most influential bias, with the highest value of *Aw*/*w* at 1.25. This indicates that Herding Bias has the greatest impact on portfolio performance according to the study. It suggests that investors' tendency to follow the crowd significantly affects their investment decisions.

Loss Aversion Bias ranks second with a value of 0.90. While it is less influential than Herding Bias, it still plays a significant role in shaping investor behavior. The substantial weighted sum vector indicates that Loss Aversion Bias also affects portfolio performance notably, though not as strongly as Herding Bias.

Anchoring Bias is ranked the lowest with a value of 0.40, indicating it is perceived as the least influential among the three biases. This suggests that while Anchoring Bias does impact investment decisions, it has a comparatively smaller effect on portfolio performance relative to Herding and Loss Aversion Biases.

These results highlight the need to focus on mitigating Herding Bias when addressing portfolio performance issues, while still considering Loss Aversion Bias as a relevant factor. The lower impact of Anchoring Bias suggests it may be less critical but still worth exploring further in specific contexts. Ensure that the consistency ratio for the AHP is within an acceptable range to validate the reliability of these findings.

5 Conclusion

This study explored the impact of the behavioral biases i.e. Herding, Anchoring and Loss Aversion on women investor's portfolio performance; Using the Analytic Hierarchy Process (AHP) to measure and prioritize these biases, provides a systematic way of looking at how psychological, social or cognitive aspects contribute towards investment decisions. Women investors are most influenced by Herding Bias, followed by Loss Aversion and Anchoring Bias according to the findings. This led us to conclude that women, more so than men, trade out of either social conformity or loss aversion rather than through a rational analysis. The demographic analysis gives a snapshot of the diversity in women investors across age, education, income and experience—allowing for a complete picture to be formed about biases amongst various segments. Even though on the aggregate, women investors tend to be more prudent and risk-averse in nature they are also not immune fro irrational propensities that can erode their portfolio.

The study bolsters an expanding literature that shows gender differences in investment behavior, highlighting the importance of financial literacy and women's knowledge towards eradicating biases due to several behavioral factors. Through awareness of, and strategies to work with these biases, women investors can take better control over their financial decisions for a more successful overall portfolio and holistic financial life.

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Consumer Protection in E-Commerce: A Study of the Deceptive Advertising and Electronic Fulfillment of Contracts



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Abstract This chapter looks into the consumer protection challenges of e-commerce in the two key areas of: unfair or misleading advertising and electronic fulfilment of contracts. It has as its aim a full examination of the barriers consumers face in this area and will make recommendations for improvements to the legal and regulatory framework. Descriptive methodology is applied to gather and analyze information on deceptive advertising in online retail, the effectiveness of legislative frameworks against digital fraud, and complications surrounding electronic contract performance. The data was taken from various sources like legal documents and previous studies, then analyzed to identify key issues in a very systematic manner. The study showed an increasing trend in misleading ads by online retailers, reflecting inadequacy in regulations governing such ads. The study further identified that there is a deficit in the statutory instruments on electronic fraud that also weakens the fight against cybercrimes and emphasizes more than ever before the need to update these laws in light of technological developments. It also highlighted risks associated with credit card and electronic cash transactions, underlining the need for security standards to be improved. The problems regarding proof of electronic contracts as evidenced by this were problems of preservation and record-keeping; thus, it requires improved techniques. In lines with these findings, it recommends that laws on electronic fraud should cover all aspects of cybercrime. It recommends improving security measures of electronic payments by introducing dual ways of verification and having security updates done regularly. In addition, the study stresses the need for specific criteria

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to acknowledge electronic documents as admissible legal evidence, the development of strategies for data retention and prevention of fraud, more vigilance related to the risks associated with false advertising and electronic payments, and education for people on how to protect their personal information and prevent fraud.

Keywords Deceptive advertising · E-commerce · Electronic fulfillment · Electronic contracts · Consumer protection · Electronic fraud · Legal legislation · Electronic payment security · Digital documentation · Fraud awareness

1 Introduction

It is an important symbol of the development of information technology, and it has a special impact on modern individuals and enterprises who are actively using e-commerce. With the increasing dependence on e-commerce, various legal and regulatory issues have emerged that require attention to protect the legitimate rights and interests of both parties in electronic transactions and to ensure fairness. Misleading advertising by online stores, as well as problems related to electronic contract formation, represent two major considerations within this spectrum [1].

A major problem of deceptive advertising by online retailers is one of the major challenges that consumers face in e-commerce. Such advertising can lead to ill-informed consumer decisions based on false or overemphasized claims, therefore harming consumer rights and market fairness. Therefore, the protection of consumer rights depends greatly on the accuracy and honesty of advertisements [2].

On the other hand, equally important issues are raised regarding the performance of parties to contracts formed by electronic means. This includes difficulties relating to the validity of such contracts, identification of electronic signatures, and ensuring that obligations are met in the requirements of law and good practice [3]

This paper tries to explore the above-discussed issues from a legal and regulatory perspective with a view to enhancing consumer protection and ensuring effective contract implementation in the light of challenges brought about by e-commerce. In so doing, it endeavors to offer some proposals on how to embody legislative and regulatory reforms for establishing transparency and security in the conduct of electronic business.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze issues related to deceptive advertising in online stores.
- Assess the legal framework for combating electronic fraud.
- Explore issues related to the electronic execution of online contracts.

- Analyze problems with evidence in e-commerce.

1.2 Study Methodology

A descriptive methodology was utilized in the study to examine its subject matter. Various sources, including legal reports and prior research in the area, were tapped to gather data concerning deceptive advertising in online stores. This information was rigorously analyzed to uncover significant issues and challenges related to deceptive advertising by outlining the current landscape of the phenomenon and evaluating its effects on consumers. To present a thorough and impartial view of the issue, the study also depended on the examination of pertinent legal and legislative documents to highlight critical points that require attention.

2 Deceptive Advertising Through Online Stores

A form of cyber fraud is deceptive advertising employed to market online retailers. Cyber fraud refers to the exploitation of the internet to target victims with diverse messages that lure users, resulting in their entrapment and the theft of electronic or credit accounts [4].

A multitude of deceptive online stores has surfaced, seeking to exploit individuals' finances through misleading tactics. While Jordanian law does not provide a clear definition for either electronic or traditional fraud, Article 417 of the Jordanian Penal Code No. 16 of 1960 describes fundamental fraudulent practices. This article states that "anyone who deceives another into delivering property, whether movable or immovable, or a document involving a promise or a release, and fraudulently obtains it using deceptive methods that mislead the victim about the existence of a false project, event, or matter, or creates false hopes of obtaining a fictitious profit or repaying an amount obtained through fraud, or falsely claiming to settle a non-existent debt or a forged receipt, or acting with movable or immovable property without having the authority to do so, or using a false name or incorrect status" [5].

In a similar vein, Article 15 of the Cybercrime Law No. 17 of 2023 fails to offer a precise definition of electronic fraud. Instead, it declares that "anyone who commits a crime punishable under any applicable legislation using the information network, any information system, or a website, or participates in, intervenes in, or incites its commission, shall be punished with the penalty specified in that legislation" [2, 6].

The Federal Penal Code in the UAE does not provide a clear definition of electronic fraud; however, Article 399 addresses "punishment by imprisonment or a fine for anyone who unlawfully acquires property or a document, or alters or destroys it, through deceptive methods or by using a false name or incorrect status, if such actions are aimed at misleading the victim into surrendering it" [7].

According to Article 10 of Federal Decree Law No. 34 of 2021 regarding the Combatting of Rumors and Electronic Crimes, "any individual who deceitfully utilizes a network protocol address that belongs to another person, or employs any other method, with the aim of perpetrating a crime or hindering its discovery, will face temporary imprisonment and a penalty ranging from AED 500,000 to AED 2,000,000, or one of these sanctions. Consequently, the fraud described in Article 399 of the Federal Penal Code falls under the regulations specified in Article 10 of the Federal Decree Law related to the Combatting of Rumors and Electronic Crimes. From a jurisprudential viewpoint, electronic fraud is defined by some as "any criminal activity that is wholly or partially carried out via electronic methods, utilizing the internet, with the intention of unlawfully acquiring someone else's money through deceit and fraud" [8, 9].

It is characterized by some as "a crime executed through misleading tactics aimed at persuading the victim to invest in a fictitious scheme or to generate profit by instilling hope through informational channels, whether via direct engagement between the offender and the victim through the network or through direct manipulation of computer data, employing false information to trick the computer and carry out fraud [10].

It can also be described as the "intentional alteration of information and data that signifies monetary worth within a computer system, or the unauthorized entry of precise information and data, or the manipulation of commands and directives that control programming [11], or any other method that influences the computer to execute operations based on these data, commands, or directives, with the aim of achieving unlawful benefits and inflicting damage on others" [12, 13].

Due to technological progress that has erased geographical limits, electronic fraud is regarded as a transnational crime, contributing to the proliferation of offenses such as e-commerce fraud. Its serious nature stems from its substantial consequences, rising occurrence, and the challenges associated with proving it [14].

Fraud has transformed from basic tricks targeting individuals to the establishment of counterfeit projects and stores that are run under deceptive external facades. This transformation is linked to technological progress that has interconnected the globe, making the internet and online retail platforms ripe for a range of criminal activities, taking advantage of the surge in consumer traffic [15]. Consequently, any e-commerce platform has the ability to mimic reputable marketing websites and generate deceptive advertisements that mislead consumers, ultimately damaging the legitimate site owner. For example, an online store in Jordan called "Shein" that sells comparable products of differing quality while employing misleading advertising tactics to draw in as many customers as possible negatively impacts the authentic "Shein" website and erodes consumer confidence. Consequently, electronic fraud manifests in multiple ways, including the creation of counterfeit online stores that mimic well-known marketing sites, which ultimately harms the legitimate owners of those sites. A particularly hazardous tactic found in online retail is fraudulent advertising, where sellers deliberately employ misleading advertisements to misrepresent their products or services, thus misleading consumers. Given its severity, this topic

will be examined thoroughly, along with the efforts of legislators in Jordan and the UAE to tackle it, despite its prevalence across online stores [16].

3 Electronic Fulfillment of Electronic Contracts

Given the rapid nature of electronic contracts, which are finalized online, it is crucial that payments are processed as quickly as the contracts necessitate. In the realm of electronic contracts, payments are also conducted electronically, referred to as electronic payment. This term is described as "the process of paying for products or services digitally from a store or website by entering the customer's card or bank account details and completing the data entry [6, 17].

According to this definition, payment methods can be categorized as follows.

3.1 Credit Card Payments

A bank or another financial institution issues credit cards, enabling the holder to purchase goods or services on credit. The holder is not required to maintain an account with the issuing bank; rather, the bank covers the amount owed for the client and subsequently recoups this sum from them. Credit cards feature a repayment grace period and a credit limit, which denotes the highest amount the cardholder is permitted to utilize [5, 18].

3.2 Electronic Money

Commonly referred to as smart cards, these are slim electronic cards that contain all the holder's information, including name and address. They can also function as a disk that is inserted into a computer for transferring funds to or from the internet [19, 20].

3.3 Electronic Wallet Payments

This approach requires individuals to acquire electronic currency from their bank, which subsequently issues a card that corresponds to the virtual funds purchased. The card is kept on the bank's online platform. While making online purchases, the individual moves the payment from their virtual account to the seller's virtual account on the seller's site, which then deposits the amount from the virtual account into their standard bank account [21].

3.4 Electronic Check Payments

In this approach, the buyer inputs their account number on the website of their bank and initiates a request for an electronic check. They receive an electronic form to complete, which includes the check amount, their account information, and a security number. After electronically signing the form, the bank transfers the specified check amount to the seller's account, taking a commission from the total amount of the check [8, 22].

While electronic payment offers the benefit of quicker transactions without lengthy delays, it also brings challenges linked to credit card usage. This association has resulted in a rise in card theft, the theft of user information, and the cloning of credit cards, rendering users more susceptible to fraud. Furthermore, online retailers may keep personal and credit card details even after the end of their contractual relationship with customers. The primary concerns surrounding electronic payments center on security; it is crucial to have sufficient safeguards against those who create deceptive online stores that imitate reputable websites to mislead shoppers [11, 23]. These counterfeit sites deceive users into providing their credit card information under the guise of purchase confirmation, which can lead to unauthorized access to their bank or credit card details, potentially causing theft and significant financial losses. Additionally, electronic checks remain vulnerable to both forgery and theft [24, 25].

Considering the various dangers linked to credit cards, it is essential for legislators in both Jordan and the UAE to offer sufficient safeguards. Individuals must verify that they are engaging with reputable retailers, refrain from disclosing their credit card details, and consistently update and securely safeguard their cards to avert electronic theft [26].

At present, banks enhance security by sending a "secure code" to the buyer's mobile device during the payment process, which must be inputted to validate the purchase. The researchers advocate for making this procedure a legal requirement for all transactions. Furthermore, it is suggested that dedicated cards with predetermined limits be utilized for purchases, or that specific cards be issued for these types of transactions [27].

4 Issues Related to Proof

The primary purpose of written documentation in the majority of legal systems is to serve as proof. Typically, legal structures necessitate a written record to validate legal transactions. Nonetheless, the reliance of electronic commerce on non-physical documents creates obstacles in transaction verification and impedes the growth of online commerce. Due to their inherent characteristics, electronic documents frequently pose challenges when utilized as proof [28, 29].

4.1 Electronic Documents

Contracts established online consist of one party transmitting information and data that encompass a particular commercial proposal via the network. Various legal frameworks have outlined several terminologies for this data, including: electronic documents, data messages, and other terms that are commonly utilized to finalize the majority of electronic commerce agreements. An electronic document is characterized as "written content on a specific type of medium, whether paper or other electronic means [11, 30].

Definitions vary, with some characterizing it as "writing on an electronic medium accompanied by an electronic signature to establish a legal fact" [31]. Others refer to it as "letters, numbers, symbols, or other forms that offer recognizable indications utilized for transmitting data electronically within the realm of online commerce." As noted by the researchers, an electronic document encompasses any information or data communicated through electronic channels, serving to represent exchanges between parties to convey information or substantiate a right [15, 23].

Electronic documents can be categorized into several types [7, 32]:

- **Informal Documents**: These documents are produced by individuals without any official involvement in their creation. As long as they are signed, these papers do not need to adhere to a particular format to be accepted as valid proof, unless there is a denial.
- **Official Documents**: Legally authorized public officials prepare these to notarize contracts. The notarization by an authorized public official lends authenticity to an official document.

To be deemed legally valid, electronic documents must adhere to a particular framework. They should possess clarity, readability, and durability. The content must be consistent and able to be referenced during disagreements. Unlike electronic formats, traditional media offer the advantage of long-term preservation due to their tangible characteristics. Although electronic documents can be susceptible to device failures, more sophisticated techniques can be utilized to maintain information over longer durations and safeguard against alterations [33–35].

For electronic documents to be recognized as valid proof, they need to be clear and legible on a medium that guarantees their longevity and should remain unchangeable. Yet, these documents initially fall short of a crucial requirement necessary for their proof function: the capacity to establish trust in the information recorded. They can be vulnerable to tampering or forgery. However, contemporary information systems equipped with sophisticated techniques are capable of detecting any changes made to electronic data and can precisely pinpoint altered information, impacting their validity and acceptance as proof.

From the viewpoint of the researchers, the challenge of establishing proof can be tackled by ensuring that the electronic document retains its final version and is safeguarded against alterations. This can be accomplished by placing the document in electronic containers that are inaccessible or by transforming the text into a static

image that cannot be modified. Moreover, it is essential for the document to bear an electronic signature [19]. An electronic signature is described as "a specific procedure executed by the individual signing the document, which instills confidence that it was indeed issued by the rightful owner and prevents unauthorized use by others" [36]. This electronic signature is crucial for the signatory to validate the document's contents [37]. Nonetheless, issues emerge from the disconnect between the signature and the identity of its owner, as well as the risk of it being duplicated without the owner's knowledge or consent, particularly when advanced technological methods are employed for its protection [38–41]. Additionally, there is no assurance that an electronic signature accurately conveys the signatory's intention to agree to the contract and accept associated obligations [42–44]. It remains uncertain whether the individual electronically signing is truly who they claim to be, especially if the actual signer is not physically present during the signing process [37, 45–47].

The researchers assert that it is essential to establish solid legal proof and eliminate any uncertainty related to electronic documents and signatures [48–50]. Achieving this goal requires the development of a legal structure that allows specialized authorities to certify signatures, thereby fostering trust and security in electronic transactions [51, 52]. This structure should involve linking any signature-related contractual process to either an email address or a designated phone number, with a confirmation text message from these authorities verifying that the individual whose signature was utilized has engaged in an electronic contract [38].

When it comes to the evidential significance of electronic writing, numerous legislations treat electronic documents on par with traditional written forms, failing to differentiate between paper and electronic records. Therefore, recognizing the legal implications of documents in electronic format is essential. This perspective is adopted by legislators in both Jordan and the UAE. As stated in Article 19 of Jordan's Electronic Transactions Law, "The holder of the electronic document is considered the rightful owner of a transferable document with rights and defenses similar to those of a bearer of a conventional document, provided the document meets all its requirements unless otherwise agreed" [39].

According to Article 18/1 of the Federal Decree-Law on Electronic Transactions and Trust Services, "The acceptance of electronic signatures, electronic seals, or electronic documents as evidence in any legal proceedings shall not be denied solely on the grounds that they are in electronic form and processed through trust services and accredited trust services" [40]. Furthermore, Article 17 of the Civil and Commercial Transactions Evidence Law clarifies that "Any transfer, sending, receiving, or storage of symbols, signals, writings, images, or sounds, regardless of their nature, through an information technology medium is considered written." Provided that they comply with the conditions outlined in the law, electronic documents and electronic writing possess the same evidentiary weight as traditional writings and documents [41–45]. Consequently, legislators in both Jordan and the UAE have assigned electronic documents the equivalent legal status as that of conventional documents [46–48]. This implies that electronic documents will produce the same legal consequences as traditional written documents, as long as the required criteria for classifying them as electronic written documents are fulfilled [49–51].

4.2 The Electronic Commercial Register

Similar to conventional commercial books, the commercial register plays a comparable role in documenting the transactions carried out by traders. This record, known as the commercial register, is where all transactions are logged and acts as a tool for proof in case of any disputes. Indeed, Article 2 of the Jordanian Electronic Transactions Law describes the electronic register as "an information message that includes a record, contract, document, or any other kind of document, which is created, stored, utilized, copied, transmitted, communicated, or received through electronic methods" [15, 30, 42, 52].

5 Conclusion

To summarize, this research highlights that deceptive advertising in online retail and problems concerning the fulfillment of electronic contracts rank among the major challenges confronting e-commerce today. The results demonstrate notable deficiencies in existing laws and regulations, resulting in heightened risks for consumers and eroding their confidence in the e-commerce landscape. Drawing from the examination of data and legal documents, it is crucial to implement decisive actions aimed at improving regulatory effectiveness and bolstering security measures to safeguard consumers against fraud.

5.1 Results

The study concluded the following results:

1. The rise in deceptive advertising techniques in online shops is harmful to consumers and shows the need for better regulation of these advertisements.
2. There are laws related to specific definitions of electronic fraud that have not been clearly defined, leading to problems in effectively addressing cybercrimes. This highlights the need for enhancements and updates in the legislation so that it is more extensive and up-to technological progress.
3. The research found increased risks with credit cards and electronic cash fraud and information theft. Thus, more strict security measures need implementation to enhance the safety of e-payment systems.
4. The research faced problems while authenticating electronic agreements. This underscores the need for higher levels of preservation and documentation techniques so that the validity, reliability, and accuracy of electronic transactions can be maintained.

5.2 Recommendations

1. Update electronic fraud laws to ensure they cover all aspects of cybercrime.
2. Improve electronic payment and credit card protection methods, such as the use of two-factor authentication and regular security updates.
3. Establish clear standards for accepting electronic documents as legal evidence, including developing technologies to store data and prevent fraud.
4. Raise awareness of the risks of misleading advertising and electronic payments, and train individuals to protect their personal data and avoid fraud.

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An Efficient Healthcare Monitoring System Using IoT



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Abstract In the rapidly evolving Internet of Things (IoT) ecosystem, parallel and distributed computing plays a critical role in managing the massive data flows generated by IoT devices. This includes addressing issues that create implementation challenges, such as processing bottlenecks due to large data volumes and the diversity of IoT devices. To solve these problems, advanced technologies such as MapReduce, parallel databases, and platforms such as Apache Hadoop and Spark are used. These methodologies distribute computing tasks across nodes, speeding up data processing and analysis. Parallel and distributed computing enable organizations to efficiently process IoT data to drive real-time insights and improve service delivery through optimized processing and analysis.

Keywords IoT · Apache Hadoop · MapReduce · Technological progress

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1 Introduction

The Internet of Things plays an important role in society. Make your life more convenient by easily connecting various devices. Communication. The main goal of IoT-based services. Healthcare is designed to provide users with deep insights without much effort. This saves effort and money and improves communication quality life [1].

The Internet of Things provides the ability to connect networks to networks. A device that delivers efficiency, reliability, and digital intelligence. This service is aimed at elderly and frail patients with medical conditions. Many healthcare systems are integrated using smart technologies. Devices such as smart sensors, remote servers, and networks connection device [2].

The mobile computer supports IoT services using the M Health System mobile application. These mobile services are used for the following purposes: promoting healthcare and providing effective and efficient solutions. Mobile health integrates the Internet of Things. It provides various services such as IP connectivity, miniaturization and security, and low power consumption [2]. Numerous mobile applications have recently been developed, enabling us to offer a wide range of medical services through mobile devices.

The evolution of the Internet of Things is getting bigger and bigger with time, and various researchers are coming up with ideas. Kinkorova and Topolčan [3] developed the Ho-kernel. The reasons for pursuing the business in 2020 are the financial system, biobanking, and intuition [4]. A gift analysis study of 499 elderly patients with congestive heart failure. Studies have shown that older people tend to be older [5].

Over 60 years. The study sample was collected after 19 months of continuous clinical follow-up [6]. Relationship between regular sizes. In the biomarkers and treatment effects of loop diuretics, spironolactone, beta blockers, and renin were confirmed [7]. Angiotensin system inhibitors with risk of hospitalization due to heart failure. Generation of hypotheses [8]. Nazir et al. [9] identified a variety of healthcare-related problems [10]. Recently, a pandemic (global pandemic) has occurred due to the spread of non-communicable diseases [11]. Illness, lack of formal education, poor medical care and ethical considerations of treatment, poor communication from politicians. At the same time, the nature of healthcare makes computing devices unique. Different types of communication.

Thanks to integration, expensive hardware components, and individual approaches to the patient and care make the device more expensive. Many IoT applications include medicine, disease management, and clinical decision support. Researchers encounter many things [12]. There was a problem retrieving extended information [13]. IoT device applications and sensing in healthcare [14]. Disease and treatment [15]. Existing literature reports a variety of approaches [16]. Minimize time, cost, and quality [17]. Although care and privacy of healthcare facilities are at our doorstep, there is a lack of comprehensive research in the latest literature. Healthcare-based parallel computing for efficient IIoT has been reported [18].

Therefore, this study provides a comprehensive analysis of the existing IoT in healthcare [19]. Parallel computing. This study will be useful to researchers. This provides a new solution and is considered evidence. The purpose of this article is to demystify some of the mysteries surrounding human intelligence, particularly the Internet of Things in the brain for knowledge acquisition and problem solving, as well as medicine [20].

2 Theoretical Framework

Several approaches have been presented by researchers for healthcare based on the IoT [20]. The IoT devices are interconnected with each other for the smooth communication of devices for human needs. IoT has the applications of using mobile computing and has stayed with a substantial role [21]. An interface is provided with the help of mobile applications for the data collected from different wearable devices and sensors. Such data are used for different analyses and many other purposes [22].

Mobile apps with the use of personalized healthcare systems have massive applications in healthcare where the devices are connected through different gyroscopes, accelerometers, altimeters, and other reduced-cost devices that are portable [23]. With the growth of wearable devices, mobile applications, and their commercial use, the idea of the IoT-based personalized healthcare system becomes more widespread [24]. Such systems in healthcare are linked with each other for creating an IoT network to perform different activities like surgeries at distance, monitoring, and identifying disease [25]. The use of mobile computing based on IoT in healthcare provides massive services through the interface of mobile phones, apps, or the M-Healthcare system [26]. IoT devices are linked to the M-healthcare systems for contributing to the IoT for providing different services such as IP connectivity, consumptions of less power, security, and compactness [27].

Today, diverse mobile apps are developed for providing services to the users in the healthcare system [28]. These applications empower the patients to identify the disease based on the analysis in the field of pediatrics and gynecology [29]. The idea of smart healthcare arose with the use of mobile computing in the IoT [30]. The services of smart healthcare are linked to wireless technologies with low power for building the IoT, and the concept is called Smart Health IoT [31]. The history of the patient is monitored through the interface by which the patient is connected to the smart healthcare IoT [32]. Such a history shows the patient's status, whether the patient is in a move or a home environment. This connection is made through vital-sign sensors linked to the mobile phones [33].

The smart healthcare IoT is useful in situations where the patient requires constant care and monitoring to facilitate the services, like patients with disabilities, elderly people living alone, patients with heart attacks, patients with high blood pressure, and stress patients [34]. The patient's location can also be traced with the help of GPS coordinates if any emergency occurs [35]. The smart healthcare IoT provides the services of enhanced care at low cost and better treatment. Several other approaches

are available for facilitating healthcare based on the IoT [36]. Figure represents the IoT architecture of the healthcare system. In this figure, the IoT applications are connected with various IoT devices, users, communication systems, health, security mechanisms, and others [37, 44, 45].

Diverse approaches have been used by different researchers to facilitate healthcare with the support of the IoT devices. These devices are integrated for smooth and efficient running of the activities of healthcare [38]. Parallel computing plays a significant role in efficiently running activities in healthcare. The approaches of IoT use deal with different perspectives of healthcare. Different healthcare documents are used globally [39].

The healthcare companies face numerous issues in their conception and analysis on a large scale. For its semantic transformation and to overcome the problem, a Hadoop-based approach is adopted and presented clinical architecture standard documents for the case studies [40].

Big data mining has its own role in extracting important information from the big data in order to use it in healthcare for facilitating patients care and to provide better care and treatment [41]. The nature of healthcare data is different, such as analytics of heterogeneous and complex data spaces, sensitive data, nontextual information, distributed data, data with constraints of security and performances, analytics to assimilate information of bioinformatics based on clinical interpretations at organ, tissue, and organism scales to define the "physiological envelope" through the patient life [42]. The role of social media is obvious in collecting data about diverse issues of patients in healthcare, with the easy access of social media to all of its users without any disruption compared to standing in long queues at conventional healthcare stations [43].

Figure 1 depicts the architecture of an IoT-based healthcare monitoring system, where connected devices, mobile platforms, and cloud services work together to provide effective and real-time healthcare. Intelligent devices and wearable sensors continuously capture critical health information such as temperature, heart rate, and activity. It is transmitted through low-power wireless communication modules to central processing units and mobile applications. Sophisticated computing methods such as parallel processing and big data analytics (e.g., Hadoop, Spark) process this data to provide real-time insights. The architecture provides secure communication and data protection through the use of encryption and authentication mechanisms. End users such as patients and clinicians utilize the system via easy-to-use mobile interfaces. Patients get real-time feedback, reminders, and alerts, whereas clinicians can view detailed reports for proper diagnosis and remote monitoring. Overall, the diagram represents a smart, networked system that improves healthcare delivery via IoT, mobile computing, and data analytics integration. With the help of the Facebook application, more than 1400 users were engaged in collecting data on their adherence to the Mediterranean diet, cardiovascular risk, and neurological degenerative diseases with low adherence to a healthy diet [44, 45]. The data were gathered in a shorter amount of time without delay [14]. A summary of these approaches from the existing literature is analyzed and shown in Fig. 1.

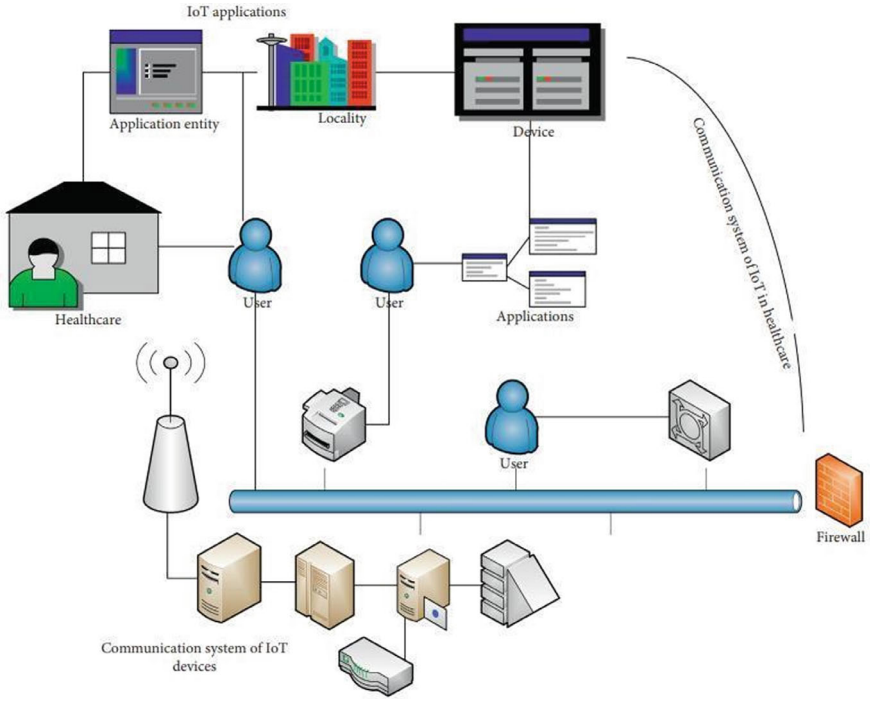


Fig. 1 Healthcare monitoring system

3 Working Details

PIR sensor (passive infrared sensor)—motion detection: How it works: PIR sensors detect motion by detecting changes in the level of infrared light emitted by objects in their field of view. The product consists of two main components: a pyroelectric sensor and a Fresnel lens. Pyroelectric sensors detect changes in infrared radiation emitted or reflected by objects in their field of view. When an object moves within the sensor range, the infrared radiation pattern detected by the sensor changes. These changes cause the sensor to generate signals that indicate movement. Applications: PIR sensors are commonly used for motion detection in security systems, automatic lighting systems, and smart home devices. When motion is detected, sensors can sound an alarm, turn on lights, or activate other devices.

Ultrasonic Sensors—Social Distancing: How It Works: Ultrasonic sensors use ultrasonic waves to measure the distance to an object. It generally consists of a transmitter that emits ultrasonic waves and a receiver that detects ultrasonic waves reflected by objects. By measuring the time it takes for ultrasound waves to reach an object and return, the sensor can use the speed of sound to calculate the distance to the object. Applications: Ultrasonic sensors are used in social distancing systems to monitor the distance between people in public places. By placing ultrasonic sensors

in strategic locations, such as entrances or checkout counters, the system can detect when people are too close to each other and issue warnings or notifications to keep them at a safe distance.

BMI calculator: How it works: Body mass index (BMI) is a measure of body fat based on a person's weight and height. BMI formula: BMI = weight (kg)/(height (m))^2. The BMI calculator uses this formula to calculate an individual's BMI based on weight and height input. Application: The BMI calculator is widely used in medical institutions, fitness centers, and online health tools. This provides an easy way to assess whether a person's weight is within a healthy range for their height. BMI is often used as a screening tool to identify potential health risks associated with weight.

Medical Alert: How it works: Medical alerts are devices designed to remind people to take their medications at specific times. This typically consists of a clock or timer function, a programmable medication reminder schedule, and an alarm or notification system that notifies the user when it is time to take medication. Application: Medication Alerts are used by people who need to take medications regularly, such as people with chronic illnesses or complex drug regimens. It helps ensure medication adherence by providing timely reminders and reducing the risk of missing medications.

Temperature sensor—for temperature measurement: How it works: A temperature sensor measures the ambient temperature. There are many different types of temperature sensors, including thermocouples, resistive temperature sensors (RTDs), and semiconductor sensors such as thermistors. These sensors detect changes in temperature by measuring corresponding changes in electrical resistance, voltage, or other physical properties. Applications: Temperature sensors are used in a wide range of applications, including environmental monitoring, HVAC systems, industrial processes, and home appliances. It provides critical data for controlling and monitoring temperature-sensitive processes and equipment, ensuring optimal performance and safety.

Arduino Uno P3: Description: Arduino Uno R3 is a popular microcontroller board based on the ATmega328P microcontroller. It features digital and analog input/output pins, built-in voltage regulation, USB connectivity for programming and communication, and a variety of other features that make prototyping and electronic design easier. How it works: The Arduino Uno R3 board is programmed using the Arduino IDE (Integrated Development Environment), which allows users to write and upload code to the board. The code runs on the microcontroller to control connected sensors, actuators, and other electronic components based on programmed logic. Applications: Arduino Uno R3 boards are widely used by hobbyists, students, and professionals to prototype and develop a wide range of electronic projects, including home automation, robotics, Internet of Things (IoT) devices, and interactive art installations. It provides a flexible and accessible platform to learn and experiment with electronics and programming.

4 Findings

A versatile healthcare tool, the system is designed to address all aspects of self-management. Its main functions include measuring body temperature and pulse, calculating BMI, detecting nearby objects or the human body, and providing medication alerts.

The device uses temperature and pulse sensors to measure body temperature and pulse. It stores physiological parameters and displays them on the LCD screen when the user is inspired. It also indicates a health problem by using an automatic system that warns the user with an audible alert if the temperature exceeds the predetermined limit. Height and weight. Using this information, the device calculates BMI and displays the results on the LCD screen. It also gives users a better understanding of their overall health by dividing BMI into various health categories such as underweight, normal, overweight or obese, or human life. When detected, it warns the user with a beep and displays the relevant message on the LCD screen to increase security. In the calendar, users can enter the medication schedule, and the device will set reminders in the morning and evening. These warnings are notified with an audible warning and displayed on the LCD screen, ensuring timely administration of the medicine. By combining the importance of care, environmental awareness, and medication management, it enables users to take important steps in managing their health. The component details are mentioned in Table 1.

The code begins with an initialization that includes the required libraries and sets up pins for the various components: LCD, sensors, buttons, buzzer, etc. This allows

Table 1 Component details

Name	Quantity	Component
U1	1	ARDUINO UNO R3
U2	1	LCD 16 X 2
RPOT1	1	1023 KΩ POTENTIOMETER
U3	1	TEMPERATURE SENSOR [TMP36]
DIST1	1	ULTRASONIC DISTANCE SENSOR (4-PIN)
PIR1	1	– 157.0704026733083 – 284.08300347342134 – 108.07058382195396 PIR SENSOR
R2	1	220 Ω RESISTOR
PIEZO 1	1	PIEZO
S1, S2, S3, S4	4	PUSHBUTTON
R6, R7, R8, R1, R5	5	1 KΩ RESISTOR
R3	1	PHOTORESISTOR

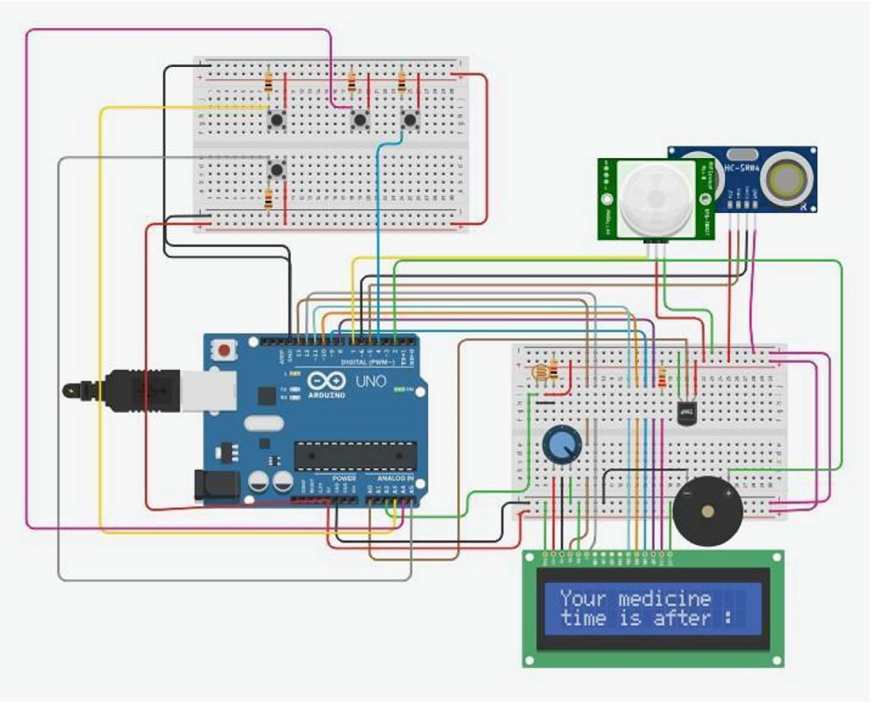


Fig. 2 Healthcare system connections

the Arduino board to communicate with these components. Figure 2 shows the healthcare system connections. The setup() function, which runs once when the program starts, sets pins as inputs or outputs, and initializes the LCD. A welcome message will appear on the LCD, indicating that the system is ready for use. Additionally, pinMode is set for pins associated with sensors and actuators.

The loop() function contains the basic logic of a continuously executing program. It waits for the user to enter a button and performs different actions depending on which button is pressed. When button 1 is pressed, the system measures body temperature using a temperature sensor connected to pin A0. Temperature readings are displayed on the LCD display. If it exceeds 38 °C, which indicates fever, a warning message will be displayed and an alarm will sound. During the 10-s countdown cycle initiated by button 1, heart rate is measured using the heart rate sensor connected to pin A2. Heart rate values are displayed on the LCD display. If your heart rate exceeds a certain threshold, a warning message will appear and an alarm will sound.

When you press button 2, you will be prompted to enter your height and weight through the serial monitor. Your BMI is then calculated using the height and weight you enter. The calculated BMI value and corresponding BMI category are displayed on the LCD display. Pressing button 3 activates the ultrasonic presence sensor. When

a person is detected within a certain distance, the message 'Person detected' is displayed on the LCD, and a buzzer sounds.

Pressing button 4 will prompt the user to enter the medication reminder time (hours, minutes, seconds) via the serial monitor. The system continuously checks the current time and compares it to your set medication reminder time. When the medication reminder time comes, a reminder message is displayed on the LCD, and a warning sound sounds. Therefore, this Arduino code creates a health monitoring system with many features, including temperature measurement, heart rate monitoring, BMI calculation, human presence detection, and medication notification. It uses sensors, buttons, and sounds to interact with the user and provide real-time feedback on health parameters [35–39].

5 Conclusion

IoT innovations are spreading across all aspects of life, especially healthcare. Research and development in the field of the Internet of Things enables the production of enormous amounts of information and computing. IoT devices communicate with each other and transmit data to a central server. This data may later be received, analyzed, processed, and used by the service provider. IoHT is an advanced version of IoHT that plays an important role in observing, consulting, monitoring, and processing remote communication processes. Parallel computing plays an important role in efficient and intelligent IoHT. Reporting a comprehensive analysis of the available literature is an urgent need for the research. Community, based on which researchers will propose new solutions for effective healthcare through the IoT. The proposed study therefore provides a comprehensive review of the literature on IIoHT support.

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Socio-Technical Systems in Social Security: Balancing Automation and Human Interaction for Beneficiary Services



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Abstract This study examines the intricate relationship between human interaction and automation technologies in the realm of social security service delivery, emphasizing socio-technical systems. Technologies such as chatbots and artificial intelligence (AI) present opportunities to automate numerous tasks within social security frameworks; however, it raises the critical question of which tasks are suitable for automation and where human interaction remains vital. The research zeroes in on the implications of these technologies within social security systems, especially in more advanced economies. Utilizing a qualitative methodology, the study incorporates descriptive and analytical techniques to assess literature, case studies, and policy documents. It underscores the managerial challenges of achieving a balance between automation and human involvement to enhance efficiency, service quality, and citizen empowerment. Additionally, the research investigates how these technological innovations impact social security beneficiaries, who are increasingly regarded as lifelong clients. The findings offer both theoretical and empirical perspectives on the evolving landscape of e-government, social security policy, and citizen empowerment. Ultimately, the study presents a refreshed viewpoint on how socio-technical systems in social security can foster the creation of more efficient, user-focused public services while ensuring a balance between automation and human discretionary decision-making.

Keywords Socio-technical systems · Social security · Automation · Human interaction · Artificial intelligence · Chatbots · Citizen empowerment · E-Government · Public services · Discretionary decision-making

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1 Introduction

The application of social security policies tends to be intricate and expensive for both citizens and social security agencies [1]. Technologies that are evolving, such as artificial intelligence and chatbots, offer the potential to partially automate these processes [2, 3]. This raises an important question: which tasks should be automated, and which ones still necessitate human interaction? This inquiry is particularly pertinent for nations with robust social security systems [4]. The emphasis is placed on implementing these technologies in more developed countries and ideal contexts, rather than relying on most public benchmarks from Europe [5, 6]. While more advanced economies, including Nordic countries and Southern European nations with lesser degrees of social security, are frequently cited, they face challenges such as an alarming tendency to prioritize user control over empowerment, driven by new information and communication technologies and process reengineering [1, 7, 8]. In addition to internal academic research that highlights lessons learned and considerations, this work aims to establish a theoretical and empirical literature benchmark for emerging trends currently being pursued in social security policy and its execution. In a situation where numerous Southern European nations, heavily impacted by the recent economic downturn, are reevaluating the viability of their social security welfare systems in terms of financial sustainability and the adequacy of services offered, it becomes essential to explore the process of public scenario development and its effect on policy-making regarding the creation of new e-government services [2]. Can a dialogue be established among policymakers, academics, and stakeholders regarding undesirable policy evolution scenarios? If such a dialogue is feasible, might it shape the design of public policy? This study seeks to examine how emerging trends within the socio-technical frameworks of social security services affect citizens' empowerment in accessing or delivering these services [9, 10]. The broader viewpoint regarding the social security beneficiaries who need to be served or treated carries significant managerial implications related to efficiency, effectiveness, service quality, and the empowerment of citizens and users, which involves a shift in the 'power' dynamics between service providers and technology [2, 11, 12]. From this updated perspective, social security 'users' are viewed as lifelong clients, customers, or beneficiaries of services that may be based on compensation or recourse. This research presents a refreshed viewpoint on e-government as it pertains to social security or health policy applications, approached through the lens of complex socio-technical systems. This involves considering how the design of relevant technical systems and services interacts with the subsequent alterations in the socio-institutional layer, which relates to either the public administration or the service recipients. Various experimental implementations within developing social security or healthcare services are outlined, aiming to enhance citizen control and empowerment in relation to both administrative and technological elements [3, 13, 14]. The conclusion highlights the potential of this approach to contribute to the theoretical development of social security systems, as well as to the understanding of historical and socio-political variations in their nature and distribution mechanisms.

1.1 Background and Significance

The progress of digital technology has created a substantial chance for developing automation systems within the public sector concerning social security [15]. In this realm, innovative information systems and artificial intelligence methods are being implemented to create automation systems capable of performing tasks that public servants currently handle [3, 16, 17]. The concept of automation in the public sector encompasses a wide-ranging and general phenomenon. It can be understood through the differentiation between technical and socio-technical systems [18]. A technical system primarily consists of hardware and software, whereas a socio-technical system incorporates institutional structures, socio-cultural values, and the social actors engaged in utilizing the technology [19]. Approaches that focus on socio-technical systems in technology development consider the assumptions, frameworks, and factors from both disciplines, striving to achieve an optimal integration of these two systems [4, 20].

The idea of socio-technical systems emerged from research conducted on the implementation of new technologies in coal mines during the 1950s. In both national policy trials and corporate settings, the development of technology and organizational transformation is addressed by defining the socio-technical system(s) that need to be designed and developed, grounded in specific technological and organizational proposals [21]. The feasibility of these developing socio-technical systems, in terms of technical, social, and economic aspects, is tested experimentally within laboratory marketplaces [4, 22].

The Netherlands possesses significant expertise in the design and development of socio-technical systems across various sectors, including energy, telecommunications, public transportation, and urban planning [5, 23]. Recently, this expertise has been applied to create a socio-technical system aimed at data protection within civil registration organizations, utilizing scenario technology [24]. The process of designing such a system for data protection unfolds in four distinct phases [25]. Initially, the system boundaries concerning specific new information technology systems within the socio-technical frameworks of civil registration organizations are defined []. The second phase involves examining the impacts of these new socio-technical systems on personnel, organizational structure, tasks, and information systems through the use of scenarios. In the third phase, potential policy options to alleviate any negative consequences are developed, while the final phase entails a comparison of various scenarios [26].

1.2 Research Objectives

Although the automation of beneficiary services is anticipated to enhance efficiency and lower costs, the socio-technical system may worsen conditions for vulnerable groups, including the elderly, disabled, low-income individuals, and minorities, if it

overlooks or fails to properly balance social aspects and unintended repercussions. Research objectives following an initial exploration of the socio-technical system in social security concerning its intended aims and valuable insights from analogous sectors, the research objectives are outlined through five specific sub-goals or focus areas, as described below. The primary aim is to examine the social dimension in connection with the automation of beneficiary services within social security. Therefore, the following sub-goals for the first stage have been established:

1. Analyze the various factors influencing demographic and economic growth that are fueling the increasing demand for automation in social security beneficiary services; and assess how well the socio-technical systems align with the desired objectives, drawing insights from related sectors as a preliminary step in exploring the social aspect.
2. Investigate the possible risks within the socio-technical systems of beneficiary services in social security, along with any unintended outcomes that may arise from making informed decisions about balancing automation with human interaction, drawing on the development of parallel sectors as a potential subsequent phase in examining the social aspect.
3. Investigate and assess a thorough range of practical approaches to harmonize the technical aspects with social factors by examining proposed design changes in the social security systems of the Netherlands, Denmark, and Belgium, serving as a possible third phase in the exploration of the social dimension.
4. Examine the detailed design of the extensive array of practical solutions aimed at harmonizing automation with human interaction throughout the three case studies, considering it as a possible fourth step in exploring the social dimension.

1.3 Methodology

The research methodology for is fundamentally qualitative. A descriptive method is employed to examine a substantial body of existing literature, which encompasses academic studies, policy reports, and case studies. This information sheds light on the interaction between automation technologies and human components within social security systems, as well as how these elements affect beneficiary services. The research integrates essential findings from diverse sources to create a comprehensive understanding of socio-technical systems and their impact on service delivery. Following this, an analytical approach is adopted to assess the data, uncover patterns, and identify trends concerning the equilibrium between automation and human interaction in social security. The chapter assesses the successful incorporation of automation and human factors across different systems to improve service quality, drawing from real-world examples and case studies for its analysis. As a result, this examination facilitates the development of significant conclusions and discussions regarding the effectiveness, challenges, and possible enhancements related to the balance between automation and human participation in beneficiary services.

2 Automation in Social Security Systems

Social security systems worldwide are undergoing continuous transformation due to technological innovations. Notably, automation is being utilized to improve both efficiency and effectiveness in the provision of beneficiary services [6]. This chapter outlines various methods and technologies aimed at automating the delivery of social security services to individuals, encompassing social welfare, pensions, and unemployment benefits, among others [27]. Features such as automatic enrollment, direct bank transfers, and portable social securities are highlighted as internet and mobile technologies that facilitate passive services without necessitating formal applications from users [28]. Additionally, mobile notifications and online benefit calculators are examined as semi-automatic services that require minimal user engagement, though they do not involve formal applications [29]. To complement these automatic and semi-automatic services, call centers are presented as essential resources, as human agents are frequently needed to support users facing challenging circumstances [7, 30]. Furthermore, chatbots, which merge automation with artificial intelligence for natural language processing, are proposed as cost-effective substitutes for call centers. The chapter also introduces social media as a valuable platform for connecting with beneficiaries, particularly those from marginalized communities. Across the globe, social assistance, pensions, and unemployment benefits rank among the most prevalent social security measures. Their goal is to shield individuals and families from dropping below minimum income thresholds due to factors such as losing income from old age, disability, unemployment, or the shift to parenthood [8, 31]. Typically, these transfer payments are disbursed in cash via bank transfers. Consequently, numerous countries are focusing on delivering cash transfers through personal bank accounts, which is often regarded as a potentially economical approach. A significant ongoing evolution in social security systems, in conjunction with this financial shift, involves the initiative to establish comprehensive national registries for social security beneficiaries [32]. Legislation prohibiting data secrecy supports these automated information registries. While automation may change the dynamics among technology, organizations, and individuals within social security systems, it could also be influenced or contested by this environment. The background, key concepts, methodologies, and technological advocates of automated social security systems are discussed, encompassing two fundamental components recognized in automation theory: technical and organizational dimensions [33]. From a technical standpoint, this pertains to technologies that automate tasks once carried out by human agents []. From an organizational perspective, it involves reorganizing an entity by altering the ways in which individuals interact with one another and with technology. To sum up, the influence of automation on social security systems could be significant, necessitating comprehensive research into the interactions between social security technologies within the upcoming techno-economic landscape [34].

2.1 Types of Automation Technologies

A significant use of artificial intelligence (AI) and automation technologies facilitates the management of routine tasks, including the completion or approval of claims []. This capability enables employees who are inundated with inquiries or requests for information and claims processing to concentrate on more intricate cases that necessitate investigation or personal interaction [35, 36]. Additionally, intelligent automation finds further routine applications in virtual assistants that manage customer inquiries and chatbots designed to respond to basic questions. Although many chatbots have struggled in the past, there are notable examples of success. These fundamental applications handle simple checks or direct requests. In the realm of social benefits, such inquiries might include "Has my benefit application been approved?" or "What is the current status of my application?" Typically, these situations yield straightforward answers based on previously stored information [37]. However, there are also more complicated requests that require initial information gathering from the systems, along with verification of that information's accuracy. Estimates suggest that over 80% of requests are classified as simple [9]. The tradition of programmatic automation of current processes is significantly longer, with many of the cases generating excitement today stemming from automation as a subsequent measure following issues related to reducing workforce numbers or simply achieving cost efficiency. Numerous countries have established computerized benefit systems, and innovations in many instances have led to increased efficiency or lowered costs [38]. Nevertheless, many implementations have faced considerable challenges and adverse impacts on service quality and user experience. In certain situations, there has been widespread dissatisfaction and protests against these systems. This highlights the research area concerning socio-technical systems, emphasizing the necessity to examine the relationship between technology and its contextual environment [15]. Within social security frameworks, a systems approach often lacks an adequate controller [27]. The national or municipal conditions, including regulations or legal structures, do not adapt as swiftly as the anticipated advantages of new technologies. Queries that could once be resolved quickly and easily by suitably trained individuals with the necessary expertise may now evolve into intricate investigations, potentially leading to lawsuits and significant operational disruptions.

2.2 Benefits and Challenges of Automation

This chapter examines the social security system with an emphasis on automated interactions involving welfare beneficiaries. It delves into various technologies applicable for these interactions, design alternatives for automation, and essential factors to ensure successful implementation [10]. This investigation lays the groundwork for additional research into the automation of social security systems. Automation technologies offer a diverse array of services and are already partially integrated

within social security frameworks, carrying potential societal implications. Key tools include Automatic Decision-Making Systems, Natural Language Processing, Knowledge Management Technologies, and Automatic Logging Systems [28]. While the first two tools might replace human interactions, the latter two are intended to support them. Successful automation of specific tools hinges on certain preconditions, such as the quality of information technology, adequate and comparable digitized data, trust in technology, collaboration, clear objectives, and agreement among stakeholders. Further investigation is necessary to explore these preconditions. For effective automation design, it is crucial to conduct an assessment of tasks and activities, perform a workflow analysis, and facilitate knowledge transfer [18]. The assessment of tasks and activities should address the aim, process, context, participants, and potential consequences of the task. Workflow analysis requires examining vector fields and arrows, assessing social, technological, and workflow dimensions. Knowledge transfer focuses on technical objectives, sources, types, and methods of communication. The welfare agencies and social security systems are being tested by the aging population, leading to an investigation into automated interaction technologies [4]. It is essential to determine whether such automation is advisable, first in relation to specific tools and second concerning their consequences and limitations. A framework that addresses normative and ethical considerations for assessing societal impact needs to be established. In the Netherlands, the social security system, which is grappling with economic crises, globalization, and emerging care and welfare demands, has already implemented some automation but still necessitates a personal approach [29].

3 Human Interaction in Social Security Systems

As efforts to automate beneficiary services within social security systems continue, there is a growing demand for the integration of human-centered design principles and the recognition of human service providers' roles in the architecture of socio-technical welfare states []. Beneficiaries of social security systems fundamentally require assistance in accessing their entitlements, support in navigating the complexities of the system, and a sense of being heard and understood regarding their concerns [30]. Only human service professionals, equipped with the necessary expertise, authority, and resources, can adequately and comprehensively address these needs on behalf of beneficiaries. Technological solutions aimed at automating welfare state processes must take these essential requirements into account; otherwise, they risk becoming naive, dehumanizing, and unaccountable socio-technical systems of welfare state automation [9]. Recent research in human-centered design further emphasizes the importance of acknowledging the central role of human service providers in social security systems. Since the early 1970s, Participatory Design has emerged as a leading design discipline, concentrating on the social, cultural, and political aspects of design, where stakeholder involvement and shared power are regarded as best practices [31]. The ongoing scripting, oversight, and

significant modification of the workplace for human service providers throughout European welfare states have limited their ability to engage in system design [14]. Over decades, these processes have led to a lack of understanding regarding the nuances of human service work and the ways in which socio-technical systems can both support and obstruct it. This has impeded social security systems from effectively accommodating and addressing the life experiences and vulnerabilities of beneficiaries. Consequently, the exclusion of human service providers from the initial design phases raises concerns about design equity; beyond that, it prompts a wider examination of the future of welfare state environments in Europe. This chapter posits that prioritizing welfare provision over financial considerations is essential, or Europe may risk losing its identity.

3.1 Importance of Human-Centered Design

Socio-technical systems, which encompass the interplay between individuals and technology within a particular context, can tackle the difficulties associated with service design by integrating both social and technical subsystems to enhance their interactions for greater advantage [20]. Services benefiting individuals in social security, especially those concerning disability benefits and services, are marked by significant complexity and uncertainty, alongside strong moral dualities, creating challenges for effective service design [32]. Furthermore, the ongoing trend of digitization in beneficiary services, which employs sophisticated technologies such as automated decision systems, raises alarms regarding the potential dehumanization and other negative consequences of digital service delivery [38]. This situation may result in the marginalization of service users, as the morphological disenfranchisement of individuals who are unable or unwilling to engage with new technologies exacerbates the so-called second digital divide.

In social security systems, achieving a careful equilibrium between completely automated processing and necessary human administrative involvement is essential, as is the strategic placement of human oversight within the automated framework [33]. To support this equilibrium, human-centered design emerges as a valuable strategy for socio-technical systems and their service delivery [3]. This multidisciplinary approach focuses on creating a service system that is both inclusive and protective, taking into account the social and technical subsystems, their interactions, and the resulting phenomena to maximize the potential benefits of these connections.

Participatory design plays a crucial role in human-centered design by ensuring the ongoing and active participation of all stakeholders, particularly service users, throughout the entire design process of a system. Its goal is to foster mutual learning among stakeholders regarding their needs, skills, imaginations, and contexts, allowing for their collective input in co-designing the system [34]. This approach is seen as an empowering endeavor that democratizes both the design process and the system being developed, enabling users or their representatives to exert greater

influence over the function and application of technology, especially in a landscape marked by increasing inequality, disadvantage, and exclusion.

In numerous European nations, the processes and outcomes of co-design are commonly known as design democracy [2]. Within these design democracy frameworks, the phrases 'co-design' and 'participatory design' are often used synonymously. Although there are distinctions between design democracy and co-design, both approaches require contributions from individuals who are not experts [7]. Input from non-expert stakeholders is essential for articulating the problem based on their needs and abilities, as well as for investigating alternative solutions, thereby guaranteeing that the final design encompasses a wider array of viewpoints [34].

3.2 Role of Human Service Providers

Automated systems can often be intricate and challenging for users to navigate, especially for vulnerable populations such as elderly individuals, those with low socio-economic backgrounds, non-native speakers, and people with disabilities [1]. Engaging with social security representatives within these systems has proven to be intimidating []. Therefore, to enhance service transactions effectively, human service providers must adopt a supportive role in automation-focused socio-technical social security frameworks [35]. This not only requires an examination of the technical systems themselves but, more critically, an understanding of the social and individual needs of users during interactions [6]. For at-risk groups, human providers are essential, serving as a significant counterbalance to the potential negative impacts of automation [22]. Beyond addressing basic requirements, they must also cater to emotional needs reflected in design and personas that are compassionate, friendly, sympathetic, pleasant, understanding, sensitive, good listeners, respectful, genuinely interested in the user and their circumstances, and caring, among other attributes [8]. To perform effectively, service providers need training and skills to operate the technical systems and should be well-acquainted with potential challenges in their application. The level of education attained by these providers plays a crucial role in shaping the socio-demographic profile of human service personnel [23]. Additionally, architectural elements like a space for personal service interactions, along with privacy, security, and a welcoming atmosphere, are essential for ensuring a positive user experience and facilitating constructive interactions [36]. It is crucial to go beyond merely addressing the fundamental aspects of human-centered design and recognizing the social requirements of users; a thorough exploration of the emotional dimensions of social interactions through human providers is necessary to optimize the functioning of socio-technical systems in areas such as advantageous survivability, consent, user satisfaction, and the success of social transactions [26]. Ultimately, human providers should be viewed as a complement to automation, contributing their own assistance while also fulfilling the emotional needs inherent in social interactions [].

4 Balancing Automation and Human Interaction

In the realm of public service, managing beneficiary services encompasses a broad array of socio-technical systems, including applications like social security, health services, and social assistance [20]. Although automation can lead to reduced operational expenses and enhanced quality, it often neglects a crucial objective of the service system which is improving the beneficiary experience [24]. The mechanisms of standardization and automation frequently disregard the intricate and individualized nature of a service system where numerous non-routine tasks coexist alongside routine ones [36]. To cut public spending on service systems while simultaneously enhancing the beneficiary experience, this chapter proposes that an effective allocation of routine and non-routine tasks between human agents and artificial agents can create synergies between the responsibilities assumed by automated systems and those retained by human agents. In contemporary societies, a variety of service systems function as an interconnected network that underpins national economies []. These systems integrate human agents and technology to develop and deliver services tailored to the requirements of beneficiaries. A key objective of a service system may include improving the experience of service beneficiaries while managing the costs associated with service delivery for providers, which typically consist of companies, agencies, or institutions in the public sector [37]. In this context, the intricate web of distinct service systems often mirrors the complexity of a spider's web, with each system operating under its own set of rules and routines [19]. Given the intricate nature of public sector service systems, routine tasks are managed by both human and technological agents to foster synergies among them, whereas numerous non-routine tasks remain assigned to human agents, as it is not economically or technologically feasible for service providers to undertake these at a significant cost [18].

Given the strong capabilities of AI systems and the difficulty of integrating them into complex socio-technical systems, four initial integration strategies are proposed [37]:

1. Downstream Strategy with Limited Automation—Agentive Systems.
2. Jumping In—Reactive Systems.
3. Man in the Loop—Interactive Systems.
4. Partnering with Experts—Collaborative Systems.

Integration strategies may be utilized alongside levels 1, 2, 3, and 4 of adaptation. These strategies can be classified as off-the-shelf, incremental changes, or transformative approaches, which involve redesigning work practices in collaboration with intended users [38]. The range of the four strategies varies from limited, low-risk (downstream) options to high-risk (jumping in) alternatives. It is crucial for users and managers to determine the need for augmentation through a bottom-up approach, taking into account potential effects, technical risks, unintended consequences, associated costs, and manual work dependencies. The decision to pursue augmentation is recommended to be made at the team level [38]. Furthermore, it is essential to consider user analytics and change management measures to assess

the impact of augmentation over time. In the case studies presented, the integration strategies were either poorly defined or involved a combination of multiple strategies. It became evident that organizations and implementers of AI solutions require domain experts capable of designing effective integration strategies, which, in some instances, proved to be a limitation. While current state-of-the-art AI algorithms can deliver satisfactory results in relatively simple applications and have been successfully applied across various domains, the AI applications in the case studies were complex and entailed numerous dependent, manual, back-office tasks.

5 Conclusion

Finding the appropriate equilibrium in the organization of beneficiary services for social security is a repetitive endeavor. Initially, concerns about fraud and misuse can result in an overdependence on human judgment. During this preliminary phase, decisions regarding eligibility are typically made by the staff or representatives of the agency responsible for benefits, who rigorously enforce complex program rules with minimal input from applicants. Consequently, some individuals seeking benefits may have their requests denied early on, often without realizing their rights to contest the unfavorable decisions issued by the agency. Following several appeals, the application might eventually reach a fair courtroom, which can lead to the implementation of a straightforward, efficient, and relatively standardized procedure intended for these applicants. Nevertheless, a rightward shift is likely to occur. Modernization reforms in the public sector have prompted numerous social security agencies to pursue cost-effective business processes. Given that evaluative criteria in many national social security programs encompass vast populations, extensive computerization has been integrated into the eligibility decision-making process. Automated screening systems have been created to process the information submitted by applicants. Only a portion of these applications is chosen for additional review by staff members. Following this automated and frequently standardized determination of eligibility, there is an opportunity for discretionary evaluation of specific cases. Typically, this manifests as local practices within the agency that address the unique policy challenges relevant to that setting. The interplay between the focus on non-discretionary procedures and the discretionary assessment of individual cases may largely remain obscured from formal oversight. Nonetheless, principles guiding discretionary decision-making tend to become more standardized and apparent in everyday operations. Another balancing dynamic is likely to occur, starting from a strict central oversight of national conditions for routine processing, moving through discretion in local and agency cultures, and then leading to a tightening of control once again. This renewed strictness aims to harmonize the disparities that have arisen. Explanatory narratives regarding the reasoning behind a specific approach to balancing typically support this process.

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Digital Transformation in the Banking Sector and Its Impact on Borrowers' Rights Protection: An Analytical Study



Yasar Alhiniti and Muhammad Nader Doshan Al-Madi

Abstract This chapter explores the opportunities and challenges posed by technological advancements in the realm of bank loans. It aims to fulfill several goals, such as elucidating the definition and features of a bank loan contract, assessing whether it functions as an adhesion or consensual contract, and comparing it with other banking agreements like credit and partnership contracts. Additionally, the study investigates the influence of bank loans on monetary policy and the local economy while offering recommendations to enhance the legal and regulatory frameworks governing bank loans. Employing a descriptive-analytical approach for data collection and analysis, the study provides a detailed description and thorough examination of the current situation. The digital dimension was significantly incorporated, focusing on how digital transformation influences the loan approval process and safeguards borrowers' rights, as well as the technical challenges and opportunities that technological innovation brings to improving transparency and streamlining procedures. The findings indicate that the bank loan contract is a binding bilateral agreement marked by its consensual nature, while it displays a contractual character during the negotiation of terms. Furthermore, the study highlights the crucial role of bank loans in shaping monetary policy. Recommendations include enhancing the clarity of loan terms and conditions, updating legislation to align with digital advancements, improving oversight of financial institutions through modern technologies, offering training and awareness initiatives for borrowers regarding the effective use of digital tools, fostering the development of new banking products in line with technological innovations, and creating an efficient system for addressing borrowers' complaints in response to digital challenges.

Keywords Digital transformation · Borrowers' rights protection · Bank loans · Technological innovation · Monetary policy

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1 Introduction

The bank loan contract is regarded as a key financial instrument. It goes beyond being a simple financing agreement between a borrower and a lender; it encompasses economic, financial, and social consequences that can affect all parties involved and the broader economy. The disparity in economic status between the contracting parties leads to an imbalance within the contract, giving it an adhesive quality. Furthermore, the commercial essence of the bank loan contract is well acknowledged. The different types of bank loan contracts raise the need to differentiate among them, which requires the elimination of ambiguities and a clear understanding of their similarities and distinctions. As a result, this study intends to offer a thorough analysis and accurate clarification of the nature and features of bank loan contracts, along with suggestions for enhancing the associated legal and regulatory frameworks [1].

In today's digital age, the banking loan industry is increasingly dependent on technology, employing digital systems for managing loans, facilitating applications, and improving transparency of information. Technologies like artificial intelligence and big data analytics play a vital role in refining risk assessments for loans and safeguarding financial transactions. Considering the profound effects of these technologies on the processes of granting and securing loans, this study also explores how digital transformation affects the safeguarding of borrowers' rights and bolsters the efficiency of the legal and regulatory framework amid swift technological advancements.

1.1 Study Objectives

This study seeks to achieve the following objectives:

1. Explain the concept of a bank loan agreement based on legal and jurisprudential provisions.
2. Learn how to distinguish a bank loan agreement from other contracts based on its specific features.
3. Analyze the basic features of a bank loan agreement such as being consensual, binding on both parties and mutual.
4. Analyze the nature of a bank loan agreement as an adhesive or consensual contract.
5. Compare a bank loan agreement with other banking contracts such as credit and partnership agreements to distinguish them.
6. Analyze the impact of bank loans on monetary policy and local economy.
7. Make recommendations for improving the legal and regulatory framework related to bank loan agreements.

1.2 Methodology of the Study

A descriptive-analytical methodology was employed in the study to gather and examine data concerning borrowers' rights in bank loans. This method facilitated an accurate depiction of the existing situation and allowed for the analysis of data, leading to practical recommendations aimed at improving the safeguarding of borrowers' rights and enhancing the effectiveness of legislation pertaining to bank loans.

2 Definition of the Bank Loan Contract and Its Characteristics

The bank loan contract lacks a definition from the Jordanian legislator, which has resulted in jurisprudence and the judiciary being tasked with defining and elaborating on some of its provisions while clarifying its concept. Thus, it is essential to first elucidate the concept of the bank loan contract and identify its characteristics. This section will be organized into two primary branches: the first branch will focus on defining the bank loan contract, while the second branch will explain its characteristics.

2.1 Definition of the Bank Loan Contract

The bank loan contract, as a compound term, necessitates that the researcher elucidate the meanings of these words within the language and subsequently define it as a compound term. The term "loan" signifies an amount of money provided with the expectation of repayment. Indeed, the lack of legal regulation surrounding the bank loan contract has resulted in jurisprudence assuming the task of defining this agreement, leading legal scholars to propose various definitions in an effort to clarify its concept and legal characteristics. Notably, the challenge stems from the diverse interpretations within jurisprudence regarding the definition of this contract, which varies based on the viewpoint adopted, given its substantial role in both legal and economic contexts. Consequently, the researchers will concentrate exclusively on the legal definition of the bank loan contract [2].

Services offered to workers have been characterized as those that provide individuals, institutions, and organizations within society with essential funding, with the debtor obligated to repay interest, expenses, and fees either as a lump sum or in scheduled installments as per the agreement [3]. The researcher contest this characterization, arguing that it fails to elucidate the contractual nature of a bank loan agreement and does not emphasize the parties engaged in the contractual arrangement. Instead, the definition only outlines the responsibilities of the involved parties.

Additionally, it has been described as a loan extended to clients for a designated purpose, which is to be repaid in monthly installments mutually agreed upon by the client and the bank, concluding with the full repayment, including interest in the installments [4].

The term "loan" is deemed inappropriate by the researchers, as the aim of the definition is to elucidate the nature of a bank loan as a contractual agreement between two parties. Additionally, it has been characterized as a contract involving the bank and the client, in which the bank provides a specified sum of money to the client, contingent upon the client fulfilling necessary conditions by presenting guarantees and a dossier that includes details such as their name, address, profession, and the intended use of the loan, along with signing sufficient guarantees to safeguard the bank's funds [5].

The researchers believe that this definition has underscored the contractual characteristics of a bank loan and made clear the parties engaged in the contracting process. Nevertheless, it faces criticism for confining the definition of the "lender" in the bank loan contract solely to the bank, when it would be more fitting to encompass either a bank or an individual authorized to perform banking activities as the lender.

An alternative perspective suggests that a bank loan contract is an agreement made between the bank or an individual authorized to perform banking activities and the client, with its focus on banking operations or financial services that the law allows the bank to offer the client through the loan agreement [6]. The researchers argue that this definition is the most thorough and effectively elucidates the concept of the bank loan contract.

From the information presented, the researchers can characterize the bank loan contract as an agreement in which a bank or an individual authorized to conduct banking operations provides a sum of money to the borrower through a loan or credits this amount into the borrower's bank account. The borrower is required to repay both the principal loan amount and the associated interest to the bank according to the specified dates and terms established in the agreement.

The Jordanian legislator has refrained from defining the bank loan contract, viewing this as a matter for jurisprudence and the judiciary rather than falling within the legislator's responsibilities. Consequently, there is a noticeable lack of comprehensive regulation regarding bank loan provisions, which are instead governed by the general stipulations of the loan contract outlined in the Jordanian Civil Code. Nevertheless, Article (59/1) of the Commercial Law does apply to the bank loan contract, stating that "Contracts of sale, loan, insurance, and all contracts whose rules are not specified in this law shall be subject to the Civil Code and customs" [7].

Consequently, the researcher will examine the loan contract as outlined in the Jordanian Civil Code and evaluate how its provisions relate to the bank loan contract. The definition provided by the Jordanian legislator describes the loan contract as "the loan is the transfer of ownership of money or a fungible item to another, provided that a similar amount, kind, and quality be returned to the lender at the end of the loan period" [8]. In contrast, the Egyptian legislator characterizes it as "a contract by which the lender commits to transferring to the borrower the ownership of a sum of

money or any other fungible item, provided that the borrower returns a similar item in amount, kind, and quality at the end of the loan" [9].

The researchers hold the view that the Egyptian legislator's definition of the loan contract is more precise, as it highlights the importance of the contractual value by categorizing the loan as a contract, unlike the approach of the Jordanian legislator. Consequently, the researcher deems it essential to revise Article (636) of the Jordanian Civil Code to align it with the definition provided by the Egyptian legislator.

In a recent judgment, the respected Jordanian Court of Cassation addressed the notion of bank loans, employing the term "credit." The court stated: "Banking operations encompass receiving deposits from the public and utilizing them, either fully or partially, to extend credit. Credit is defined as the disbursement of money by the bank to the client in return for the entitlement to reclaim it along with interest. Therefore, the provision of credit, or loans, by the bank is classified as one of the banking operations" [10].

In multiple rulings, the Court of Cassation has identified the loan given by the bank to the client as a bank loan, including in one decision where it noted: "… And given that the circumstances of this case relate to the plaintiff's demand against the defendant for the remaining amount of a bank loan …" [11].

2.2 Characteristics of the Bank Loan Contract

Based on the aforementioned explanations, the bank loan contract has several characteristics that distinguish it from other contracts, as outlined below:

The Bank Loan Contract is a Consensual Contract

A consensual contract is defined as one that is established simply through the legitimate exchange of an offer and acceptance. The modern approach to contracts asserts that consent alone is adequate to create and form the contract, unless specific formalities are mandated by law [12].

A debate exists within jurisprudence about the consensual aspect of loan contracts. Certain legal scholars view the loan contract as a real contract; traditionally, loans were seen as real contracts that required the actual delivery of the borrowed funds to the borrower [13].

In this context, the distinguished jurist Al-Sanhuri asserts that "the true essence of the loan is derived from Roman law, where contracts were initially formal. This formality was later supplanted by the act of delivery in real contracts. Nevertheless, viewing the loan as a real contract is no longer justifiable today, as mutual consent alone is adequate for the contract's conclusion" [13].

Concerning the jurisprudence of the Jordanian Court of Cassation on this issue, its decisions have consistently affirmed that the loan contract is a consensual agreement. In one judgment, the court noted: "The relationship between the parties to the case is governed by the loan contract concluded between them, and the contract fundamentally relies on the consent of the contracting parties, as outlined in Article

(213) of the Civil Code, which asserts that the contract serves as the law for those involved" [14]. Therefore, the researchers deduce that the bank loan contract constitutes a consensual agreement that remains valid through the mutual consent of both parties, demonstrated via offer and acceptance.

The Bank Loan Contract is a Bilateral Contract

A bilateral contract is formed by the loan agreement, establishing mutual responsibilities for each party involved. The lender must provide the item to the borrower and cannot request its return until the specified due date. In turn, the borrower is required to repay an amount equivalent to what was received, either at the agreed-upon time or upon demand, as outlined in the contract [15].

The Bank Loan Contract is a Commutative Contract

Contracts that are commutative involve an exchange where each participant gains something in return for what they provide [16]. Initially, the loan agreement is viewed as a gratuitous contract, indicating that the borrower must return an equivalent of the item borrowed without any alteration in value, as a safeguard against usury. This viewpoint aligns with the Jordanian Civil Code, since Islamic legal scholars regard any advantage acquired through a loan contract as usury, which refers to an increase in the debt amount in exchange for the time extended to the borrower [17].

When interest is specified as a condition for the loan, the loan contract transforms into a commutative contract [18]. Banks or financial institutions aim to generate profit through the provision of loans. Consequently, this results in a commutative contract between the two parties, where the lender (the bank or financial institution) offers the capital (the loan amount) in return for the same sum plus the interest accrued. The borrower, on the other hand, gains from the monetary amount provided for a designated period. Therefore, the bank loan contract is identified as a commutative contract [19].

The Bank Loan Contract is a Time-Bound Contract

A bank loan contract is defined by its time-sensitive nature, making the element of time crucial. The advantages gained from this agreement can only be obtained through the utilization of the asset over a designated timeframe [19]. This aspect is especially significant in the realm of bank loan contracts, as the interest rate is established according to the length of time the borrower enjoys the principal sum [10].

The Bank Loan Contract is an Innominate Contract

Contracts that are nominated are those explicitly identified and governed by the legislator through particular provisions. On the other hand, innominate contracts lack specific regulation from the legislator and fall under the general rules of the theory of obligations [20].

Upon initial examination, one might perceive the bank loan contract as a nominated contract, given that the Jordanian legislator has allocated a chapter in the legal

framework addressing contracts that confer ownership to the loan contract, specifically detailed in Articles 636–646 of the Jordanian Civil Code [12]. Nevertheless, the researchers conclude that the substantial distinctions between the loan contract as characterized in the Civil Code and the bank loan contract, which lacks specific regulatory provisions from the Jordanian legislator, render it more fitting to classify it as an innominate contract with commercial characteristics [13].

The Bank Loan Contract as a Form of Credit

Transactions known as credit operations occur when a bank consents to extend credit to a client or another individual upon the client's request, in return for a specific interest or commission, either right away or at a designated time, through capital or alternative means [14]. Banks are essential in conveying monetary policy actions throughout the economy. Although the primary source of funds for banks comes from deposits, the principal utilization of those deposits is represented by the bank credit extended to clients [15].

Banks serve as intermediaries in the relationship between savings and investments by receiving deposits from savers and subsequently lending those deposits to investors via different credit operations. The most basic type of credit provided by a bank is represented by the bank loan contract [16].

Generally, individuals who turn to bank loan agreements are not merchants. Instead, merchants tend to favor acquiring credit facilities as an open credit line, which comes with a specified limit that they can utilize as needed to avoid the unnecessary accumulation of interest on bank loans [21].

3 The Legal Nature of the Bank Loan Contract and Its Distinction from Similar Forms

The task of legal characterization involves both judicial and jurisprudential elements, as the judge assigns the correct legal definition to the case at hand before applying the relevant legal ruling. The bank loan contract exhibits resemblances to other types of contracts, which can often make them hard to differentiate, resulting in common misunderstandings. To meet the goals of this study, the researcher will split this section into two primary segments: the first segment will address the legal nature of the bank loan contract, while the second segment will distinguish the bank loan contract from comparable forms.

3.1 The Legal Nature of the Bank Loan Contract

The legal nature pertains to "the legal characterization and description of the contract. "Once the concept of the bank loan contract is defined and its unique characteristics

are detailed, it becomes evident that this type of contract can assume one of the following legal descriptions:

The Bank Loan Contract as a Contract of Adhesion

To explore how the adhesion contract influences the modification of interest rates, the researcher must initially address the legal classification of the bank loan contract and assess how the adhesion contract pertains to its legal nature. Following this, an analysis of the adhesion contract's impact on interest rates can take place. Thus, the researcher will delineate the subsequent rules:

To begin with, defining adhesion is crucial. Changes in economic, social, and electronic realms have influenced contracting practices, resulting in a broader range of adhesion contracts. In these agreements, the party with greater economic and informational power drafts the contract unilaterally, presenting the other party with the sole choice to either accept or decline it [22, 23].

The principle of the autonomy of will in contracts is undermined by these agreements, resulting in a disruption of contractual justice [24]. Modern advancements and the era's demands have influenced the legal definition of adhesion, leading numerous countries to revise their legislative approaches and embrace contemporary trends, which will be elaborated on below [25].

Typically, the intent between the offeror and the offeree is conveyed through a series of exchanges and negotiations, culminating in the offeree's decision that entering into the contract is beneficial for them [26]. However, recent economic changes have given rise to a specific kind of contract where the offeree can merely indicate their intention to participate without any room for negotiation [27]. This situation arises because these contracts pertain to vital services, like water and electricity that are indispensable [23, 28].

An adhesion contract refers to a situation where the offeree agrees to terms established by the offeror without any negotiation, especially in relation to a good or essential service that is either monopolized legally or practically, or where competition is restricted in its extent [24, 29]. The esteemed legal scholar characterizes the adhesion contract as a type of coercion; however, this coercion is economic in nature rather than stemming from psychological influences, with coercion viewed as a flaw in the will [11, 30].

Accordingly, adhesion contracts are distinguished from other contracts by the following characteristics [25, 31, 32, 33]:

- The agreement pertains to goods or services deemed vital for the consumer or recipient, including essential utilities like water, gas, or electricity.
- These products or services are either legally or effectively controlled by a single entity, resulting in minimal competition surrounding them.
- The proposal to utilize these products or services is uniformly presented to the public on the same terms, giving the other party merely the choice to either accept or decline.

According to the stipulations outlined in the Jordanian Civil Code, the concept of adhesion is not explicitly addressed by the Jordanian legislator, as it is the responsibility of jurisprudence and the judiciary to define it rather than the legislator [34]. The Jordanian Court of Cassation, in its rulings, has characterized the adhesion contract as "a contract in which the offeree accepts predetermined terms set by the offeror without negotiation" [14].

The provisions regarding acceptance in adhesion contracts were clarified by the Jordanian legislator, as Article (104) of the Jordanian Civil Code states that "acceptance in adhesion contracts is limited to merely accepting predetermined terms set by the offeror, without allowing any negotiation" [26]. This interpretation was upheld by the Jordanian Court of Cassation in a ruling, which noted that "a contract is not considered an adhesion contract if the terms set by the offeror were discussed, in accordance with the provisions of Article (104) of the Civil Code" [23].

In terms of legal safeguards for the adherent party, the Jordanian legislator has established several provisions, the most significant being the requirement that contract interpretations favor the adherent. According to Article (240/2) of the Jordanian Civil Code, "ambiguous phrases in adhesion contracts should not be interpreted in a way that harms the interests of the adherent party" [27]. Furthermore, the judiciary has been empowered by the Jordanian legislator to intervene when unfair terms detrimental to the adherent are present, with the intention of either amending or exempting these terms. This authority is clearly outlined in Article (204) of the Jordanian Civil Code [25].

The researchers critique Article (204) of the Jordanian Civil Code, noting that the judiciary's ability to intervene and modify unfair terms is merely discretionary, as evidenced by the legislator's choice of the word "may." It is the researcher's view that this authority ought to be mandatory, as such a requirement would promote fairness and enhance legal protection for the weaker party in contractual agreements. Consequently, the researchers advocate for an amendment to Article (204) of the Jordanian Civil Code. The rise of various forms and types of adhesion contracts, propelled by economic changes, scientific advancements, and technological innovations, has allowed the stronger party to create pre-drafted contracts that include unfair terms and benefits at the expense of the weaker party [35, 36]. This situation disrupts the balance of contracts and undermines the essence of contractual justice, highlighting the urgent need for judicial protection against the unfair terms imposed on the weaker party [37, 38]. Furthermore, the legislator should take action by implementing protective measures that defend the rights of the weaker party and restore equilibrium in the contractual relationship between both parties [26, 39].

Recent advancements have resulted in the embrace of a modern jurisprudence of adhesion, associating it with the existence of unfair terms, independent of the necessity for commodity monopoly [40, 41]. This modern jurisprudence asserts that adhesion is contingent upon the presence of unfair terms or their absence [27].

An unfair term is characterized as a provision within a contract that one party includes to exert their influence over the other, aiming for an extraordinary and disproportionate personal advantage, which consequently undermines the rights of the party that acquiesces to the dominance of the imposing party [28]. In the context

of Jordanian law, the concept of unfair terms is addressed in Article (204) of the Jordanian Civil Code [29].

Consequently, the researchers conclude that the modern jurisprudence of adhesion is more accurate and better reflects the demands of reality. For an adhesion contract to exist, it is adequate to demonstrate a breach of contractual equilibrium between the involved parties, alongside the presence of unfair or oppressive terms within the contract. The application of adhesion provisions does not require the commodification to be monopolized. Therefore, it is advisable for the Jordanian legislator to embrace this jurisprudence, as it aligns more closely with the realities at hand and is more precise [30].

From the above, it becomes clear that the most accurate legal description of the banking loan contract is an adhesion contract for the following reasons [47, 48, 49, 50]:

- The disparity in contractual authority between the more powerful party, the bank, and the less powerful party, the borrowing client [44, 45, 46].
- The bank, as the dominant party, prepares the loan agreement in advance, which forces the borrowing client to either accept or decline the contract without any opportunity to negotiate its terms [40, 41, 42, 43.
- The variety and multitude of banks in Jordan, which provide clients with the ability to select among them, does not indicate that the banking loan agreement is a negotiable contract that eliminates the concept of adhesion. Even with the numerous options available, these banks do not allow clients the opportunity to negotiate or deliberate on the contract's terms; they are merely presented with the choice to accept or decline. Consequently, this suggests that the banking loan contract ought to be categorized as an adhesion contract due to the existing imbalance and inequity between the two parties involved, as well as the frequent presence of unfair conditions within the contract [36, 37, 38, 39.
- The rulings of the Court of Cassation seek to reestablish the contractual equilibrium between the two parties involved, as previously noted. This aligns with the stipulations of Article (204) of the Jordanian Civil Code, which categorizes this agreement as an adhesion contract [31].

The issue of adhesion within the context of a banking loan contract has been addressed by the Jordanian Court of Cassation [31]. The court remarked: "It is determined that if the condition fails to satisfy the criteria of adhesion and the appellants have not articulated why it should be regarded as such, then the requirement for account accuracy in agreements between banks and clients does not qualify as adhesion. Clients are free to choose not to contract and can opt for another bank [32, 33]. Courts have deemed such conditions as valid [35]. Furthermore, these conditions are open to challenge, allowing for scrutiny of the accuracy of interest rate figures and their compliance with Central Bank regulations. Consequently, expertise is sought based on the specifics of each case to ensure their precision [34, 35, 36]. Rescheduling signifies a new agreement to establish due amounts, and objections from those who have signed cannot be revisited. Thus, this rationale does not influence the contested ruling and should be dismissed" [29, 37].

While this ruling reflects the court's perspective that the condition is valid and not an adhesion condition, it also implicitly recognizes that adhesion conditions could exist in banking loan agreements; otherwise, the Court of Cassation would not have addressed this clause in principle [30, 38].

The Commercial Nature of the Banking Loan Contract

Scholars find it challenging to articulate the definition of commercial contracts. The dominant perspective suggests that commercial contracts do not exist in a manner that is separate from civil contracts, which are subject to particular regulations. General rules also govern commercial contracts [11]. As a result, it is more advantageous to create a standard for categorizing a contract as commercial [12, 37].

Certain academics have sought to characterize commercial contracts as agreements that establish a commercial obligation for one or both parties involved. Nevertheless, this characterization has faced criticism for its lack of clarity, as it pertains more to the concept of commercial obligation than to the nature of the commercial contract itself [23, 38].

Concerning the stance of the Jordanian legislator, it is observed that while there is no specific mention of the concept of a commercial contract, criteria have been established to classify an activity as commercial. As a result, all operations involving currency exchange are deemed to be commercial activities [14, 39].

Consequently, the activities conducted by banks are unquestionably classified as commercial operations, governed by commercial law that pertains to limitation periods, modes of commercial evidence, and various other stipulations [15, 40]. The contention lies in determining whether the actions of the borrower are categorized as commercial or civil. Is the loan agreement with the bank inherently a commercial contract, or does it represent a mixed commercial contract? [16, 41].

Certain academics interpret the banking loan agreement as a hybrid commercial contract [42]. From the lender's (bank's) viewpoint, it is commercial, whereas the classification for the borrower hinges on their status. If the borrower is engaged in trade and the loan relates to their business activities, the contract is deemed commercial. Conversely, if the borrower is not a trader, the agreement is classified as civil [18].

For banks or exchangers, currency exchange transactions are a commercial activity. In contrast, for clients, these operations are not fundamentally commercial unless the client is a trader and the exchange pertains to their trading activities [29].

The issue regarding the banking loan contract has been addressed by the Jordanian legislator, who has classified it as a commercial activity by its very nature. According to Article (92/h) of the Jordanian Banking Law, "All banking and financial activities are considered commercial by their intrinsic nature, regardless of the status of the contracting client or their dealings with the bank, whether civil or commercial. The provisions of the applicable Commercial Law and the provisions of the Murabaha Law shall apply" [10].

The Jordanian Court of Cassation has made it clear in its judicial rulings that commercial regulations govern the contractual relationship. The Court stated:

"Banking operations are inherently commercial in nature, as per Article (92/h) of the Banking Law. Consequently, the limitation periods set forth in Article (58) of the Commercial Law are applicable to the claim at hand, with a ten-year duration commencing from the date the right arises" [1]. Article (58) of the Jordanian Commercial Law specifies the limitation periods in commercial matters as follows: "(1) in commercial cases, the right to file a claim expires after ten years unless a shorter duration is provided. (2)The right to invoke res judicata ceases after fifteen years" [12].

The researchers critique the position of the Jordanian legislator, which categorizes banking activities as inherently commercial, irrespective of the borrower's condition. This viewpoint is seen as problematic because it strays from established norms and bestows upon banks a legal status that surpasses that of the typically weaker borrower. By deeming the contract as commercial without regard for the borrower's situation, the legislator emphasizes the lender's (bank's) status. This perspective unjustly elevates banks and diminishes the intended legal protections for borrowers, who are frequently at a disadvantage in the contractual arrangement. Furthermore, borrowers generally pursue loans from banks, while traders often opt to establish credit lines with banks to sidestep unnecessary interest on loans.

4 Conclusion

Examining the assurances in place for safeguarding borrowers' rights in banking loans represents a crucial advancement in promoting financial justice and transparency within banking operations. Gaining insight into the obstacles borrowers encounter and offering targeted recommendations can lead to a more secure and efficient financial landscape. By bolstering transparency, strengthening borrower safeguards, and creating legislative and regulatory frameworks, trust can be fostered between financial entities and their clients, resulting in greater financial stability and shared advantages.

4.1 Results

The study concluded the following results:

1. A banking loan agreement is a two-party contract that entails the bank providing a sum of money to the borrower, who in turn agrees to repay the principal along with interest over a designated timeframe.
2. The banking loan agreement is defined as a consensual contract that carries a legally binding obligation for a specified duration, distinguishing it from other types of contracts.

3. While the banking loan agreement is frequently viewed as an adhesion contract, it can also exhibit a contractual character during the negotiation of its terms and conditions.
4. The banking loan agreement and credit and participation contracts are distinctly different, particularly regarding their emphasis on financing the principal sum and interest.
5. Loans from banks are crucial to monetary policy as they affect savings and investment levels, helping to meet economic objectives.

4.2 Recommendations

1. Increase the transparency of bank loan agreement terms to ensure that all parties understand the obligations and rights associated with the loan.
2. Establish effective mechanisms to protect borrowers' rights, including providing clear information on interest rates, costs and risks associated with loans.
3. Update regulations on bank loan agreements to keep up with economic and technological changes and meet market needs.
4. Improve supervision and control of financial institutions to ensure their compliance with applicable laws and regulations and protect customers' interests.
5. Provide training and education programs for borrowers on how to choose appropriate loans and effectively manage debt.
6. Support the development of new banking products that meet different customer needs and offer flexible financing options.
7. Establish an effective system for handling borrower complaints in line with digital challenges.

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The Role of Technology in Preserving Indigenous Cultures and Languages



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Abstract This chapter aims to reveal the role of technology in preserving indigenous cultures and languages, which are increasingly at risk due to globalization and advancements in technology. Indigenous languages serve not only as means of communication but are also vital channels for maintaining cultural heritage, national identity and collective memory. The extinction of these languages can lead to the erosion of cultural traditions and, consequently, the societies that uphold them. Therefore, this study employs a qualitative research design utilizing descriptive and analytical methods to explore how technological innovations, including digital platforms, language-learning apps and artificial intelligence, can support the documentation, teaching and revitalization of endangered languages. It systematically reviews existing research and case studies to provide a comprehensive overview of technology's impact on the preservation of indigenous languages. The study critically evaluates the achievements and obstacles faced by current technological initiatives and offers actionable recommendations to improve their effectiveness. The findings emphasize the need for strategic policies that position technology as a means to enhance language diversity and empower marginalized communities through cultural resilience.

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1 Introduction

Language transcends being a mere system, a basic function, or a fundamental infrastructure; it occupies a profound and significant role in the evolution of humanity [1]. The language spoken in each household acts as an essential gateway to the vast reservoir of human knowledge and the rich cultural heritage accumulated over generations [1, 2]. In the absence of a home language, children are effectively barred from grasping their origins, hindering their ability to engage fully in the shared memory that arises from the distinctive experiences of their community [3]. Thus, local languages serve not just as tools for communication; they are vital means of fostering belonging and are integral to the formation of one's identity and cultural essence [1, 4]. By appreciating and understanding these languages, individuals can forge connections that enhance both personal growth and the broader community [5, 6].

In this chapter, we discuss the crucial role that languages play in safeguarding indigenous cultures worldwide. We begin by clarifying our definition of cultural heritage and exploring the connection between language and the preservation of that heritage, particularly focusing on lesser-known languages with smaller speaker populations. The importance of technology is emphasized, as advanced tools in today's digital era can significantly aid in the documentation and preservation of languages and cultures. Our discussion includes the impact of language on heritage conservation and the effects of digital technology on educating future generations. Additionally, we examine the predominantly oral traditions of indigenous communities. We present various related digital and physical resources, projects, research studies and what is referred to as language technology. Finally, we conclude with suggestions for future foundational initiatives and pathways.

1.1 Research Significance

The significance of this research is heightened in an era where globalization and technological progress threaten the survival of numerous native languages [7, 8]. The languages being examined are not simply tools for everyday communication; they serve as conduits for transmitting shared legacies, symbols of identity and collective memories that are essential in shaping the social fabric of their respective communities [2, 9, 10]. The silence that accompanies the extinction of a language often signifies the extinguishing of its culture along with its traditions [11, 12]. Thus, by exploring how technology can be harnessed to revitalize these endangered languages, this

research addresses a matter of global importance. It aims to demonstrate—through examples from digital platforms, artificial intelligence and other innovations—that technological advancements can be utilized not only for preservation but also for education and revitalization of regional dialects [3, 13, 14]. This initiative not only safeguards those with less linguistic power across the globe but also offers support for cultural groups, ensuring that future generations remain connected to their heritage and identity markers. The findings of this research could inform policies and strategies aimed at cultural preservation, promoting technology as an ally rather than an adversary in the continuity of indigenous cultures.

1.2 Methodology

This chapter employs a qualitative methodology that encompasses both descriptive and analytical elements. The descriptive aspect evaluates the appropriate literature, including case studies, academic articles and reports that delve into the intersection of technology with the preservation of indigenous languages and cultures. This investigation methodically explores current technological resources such as digital archives, language learning apps and artificial intelligence tools used in language documentation, offering a comprehensive overview of the existing landscape. Meanwhile, the analytical component critically examines the genuine effects of these technologies on the communities by assessing the successes and challenges faced by language preservation initiatives; it also highlights deficiencies in technological applications that could lead to further advancements. Together, the descriptive and analytical methods contribute to this study by shedding light on how technology can serve as a means for cultural preservation and by providing recommendations aimed at enhancing the efficacy of these initiatives in safeguarding indigenous languages and cultures.

2 The Importance of Preserving Indigenous Cultures and Languages

The world presents itself as a vast and complex tapestry, showcasing an impressive diversity of languages, with estimates suggesting that between 6000 and 7000 are spoken around the globe [4, 15, 16]. Alarmingly, statistics indicate that nearly half of these languages may be at risk of extinction, potentially disappearing from the pages of history [17, 18]. Ironically, those languages that are spoken by the largest and most varied populations often have a minimal presence online [19, 20]. As a result, accessing crucial human knowledge and cultural heritage digitally poses a significant challenge for many indigenous cultures today [21]. The sorrowful decline of languages is taking place precisely in regions where invaluable information is at

stake [22]. Spoken languages act as essential vessels for traditional and indigenous knowledge, including the uses of numerous plants and animals, which are crucial for the survival and identity of these cultures [5, 23]. Biocultural diversity illustrates the intricate and rich interplay between biological diversity and sociocultural diversity, which collectively place upon humanity the duty of being stewards of knowledge and caretakers of the earth [24]. Effective methods for conveying experiential information about the natural world using their own distinct words and expressions are vital for indigenous cultures [25]. The authentic exchange of language fosters the preservation of both linguistic and biological diversity, ensuring that these forms of knowledge are effectively communicated and transmitted across generations [6, 26]. In today's rapidly evolving information society, significant challenges arise for the committed guardians of indigenous languages and their traditional practices due to the swift changes in media and technology [27]. There has been a recent surge of awareness regarding the vital importance of linguistic diversity to the essence of human culture, driven largely by a shared objective of cultural preservation [6, 28, 29]. Indeed, each indigenous community has the extraordinary capacity to create distinct worldviews and develop unique approaches to expressing the complexities of their surroundings [30]. These viewpoints are deeply rooted in traditional language and expressions, which subsequently influence human thought and experience. Indigenous knowledge not only validates their unique stance and elevates their voices on a global scale but also enhances their credibility in the collective endeavor to manage bioecological resources [7, 31]. Furthermore, it provides essential support for their initiatives to nurture and advance vernacular languages, enabling them to participate in and reap benefits from these ongoing efforts in ways that respect their heritage and ensure their survival [32].

Experts predict that among the roughly 7000 unique languages spoken across the world's rich and varied cultures today, a significant and alarming issue is that only about half of these languages are expected to remain in use by the end of the twenty-first century [7, 33]. This forecast brings forth serious concerns regarding the future of linguistic diversity on our planet [34]. Even more concerning is the expectation that fewer than 300 of these languages that survive will have speakers from all age demographics who actively use them in their daily lives [8, 35]. This stark reality suggests that the majority of human languages, particularly those classified as minority languages, are facing an increasingly urgent threat of extinction in a relatively short period [36]. In a similar vein, experts have shown that out of the 230 recognized nation-states and territories worldwide, approximately 110 are at significant risk of state collapse [8, 37]. This considerable danger primarily stems from the notable cultural and regional diversity that poses challenges to the essential notions of national unity [38]. The ongoing battle for both cultural and linguistic preservation in the face of the relentless and often overpowering forces of globalization may be unprecedented in human history [39]. This is particularly evident when one reflects on the significant human toll linked to these losses: the suffering, alienation and marginalization of individuals and entire communities that often accompany globalizing processes [8, 40]. Such processes typically unfold without allowing traditional societies any substantial control, resulting in feelings of despair and powerlessness.

Additionally, the current trends and their resultant effects have led an increasing number of experts to underscore the critical importance of preserving linguistic diversity in our world [23]. They assert that this diversity not only acts as a vital tool for the sustainable development of the future but also serves as an essential means of communication among the diverse cultures that inhabit our planet [1, 24]. In this crucial context, they highlight the important role that minority languages play in cultivating more inclusive, harmonious and less confrontational national societies [25]. This contribution is vital as it enhances social stability and unity, fostering a richer and more respectful coexistence among various cultural identities [26].

3 Challenges Faced by Indigenous Communities

Indigenous communities are deeply engaged in numerous essential activities that highlight the pressing necessity for safeguarding indigenous languages and other critical elements of their cultures, including traditional knowledge, artistic expressions and cultural practices [27, 28]. To achieve self-empowerment for informed decision-making within the marketplace and to encourage the authentic promotion and revitalization of their cultural heritage, many communities are starting to digitize their cultural resources and create their own databases [2, 9]. This approach not only improves information management but also increases access to cultural assets [29]. However, despite these encouraging and constructive measures taken by indigenous communities, their efforts have regrettably been impacted by a variety of intricate factors [30]. One of the most prominent challenges is the imbalanced relationship between indigenous communities and the rapidly evolving domain of Internet technology [31]. The early introduction of the Internet into numerous indigenous communities has led to the current scenario, where these communities often find themselves in predominantly passive roles regarding significant matters of information dissemination [32, 33]. The result of this situation is that many communities find themselves overwhelmed by an influx of passive information, predominantly stemming from external commercial enterprises; this information tends to be largely irrelevant to their unique and urgent needs [34, 35]. Initiatives aimed at tackling this widespread issue in indigenous communities, such as the creation of ‘home pages’ and online representation, frequently do not achieve the expected outcomes [3, 28]. When considering the numerous technological obstacles—like basic dial-up systems, insufficient web servers and dependence on outdated dial-up services for accessing online resources—these contemporary approaches are often met with doubt. Furthermore, the services leased from the Public Telecommunications Transport (PTT) fail to provide a viable foundation for development and there is a critical shortage of communal spaces for sharing indigenous content online [36]. The limited bandwidth of existing connections significantly hinders the effective distribution of multimedia content, thereby excluding essential platforms like radio and television from being utilized within these communities [37]. The current technology infrastructure in these telecenters cannot compete with the capabilities of personal computers,

primarily due to the subpar quality of the technology in use [4, 28]. Additionally, various forums have proposed solutions aimed at protecting indigenous languages and cultures through technology, which appear to have converged into three primary categories: creating and supporting indigenous databases, enhancing and establishing technology training programs and enacting laws specifically crafted to safeguard and promote indigenous languages [38]. These combined initiatives highlight the persistent efforts of indigenous communities to maintain their vibrant cultural heritage in the digital realm while also striving to regain control over their narratives and knowledge systems [5, 29].

The terms globalization and Westernization are often mistakenly used interchangeably in various discussions and analyses, primarily because the ongoing development of globalization processes is typically linked to the expanding and pervasive impact of Western culture worldwide [39]. Nonetheless, significant evidence also points to the emergence of "hybrid" forms of international art and culture, which have arisen directly from the heightened interactions in global culture enabled by globalization [40]. Key characteristics that define Western culture include humanism, secularism, rationalism and enlightenment, each of which plays an essential role in shaping societies in the West [6, 30]. The distinction between the collective tendencies frequently observed in non-Western cultures and the individualistic patterns predominantly found in Western cultures has been and remains, a central focus of research across various fields such as anthropology, sociology, political science and social philosophy [20]. These academic disciplines aim to comprehend the subtleties and consequences of cultural differences around the world [29]. Additionally, the examination of communication patterns and the vigorous exchange of cultural elements and models has become another significant area of study for social scientists dedicated to investigating the intersection of globalization and culture [7, 28]. The emergence of new information and communication technology presents a dual challenge; it is viewed as both a potential danger to cultural diversity, due to its ability to provide transmission channels that may weaken local cultures and as an important element that encourages any culture, including local ones, to assimilate aspects of the wider global culture [27]. This assimilation can foster the creation of a unique and critical individual model that harmonizes diverse influences [31]. Consequently, the analysis aims to measure and analyze dynamics over time, evaluate the influence of cultural components, investigate the effects of reforms and examine the notion of cultural distances, all of which are vital for understanding the intricate patterns of cultural interactions in an ever-globalizing world [8, 26].

4 Technology Solutions for Preserving Indigenous Cultures and Languages

In today's global environment, technology plays an increasingly crucial role in the preservation of indigenous cultures and languages. Unlike scientific literature, which predominantly arises from majority languages, the documentation and safeguarding of scientific knowledge in indigenous languages is carefully designed for the indigenous communities themselves, ensuring that this knowledge remains both accessible and pertinent to their needs [32]. This significant reflection on the coexistence of diverse forms of knowledge, each with its own unique value and perspective, profoundly inspires our work [25]. However, the planning and effective use of technology to support the preservation of indigenous languages and cultures is an exceptionally intricate challenge [22]. This endeavor requires a nuanced comprehension of how members of these communities view their surroundings, their historical interactions with the technology now being utilized to protect what is deeply significant to them, and the current political landscape regarding the roles, rights and concessions afforded to indigenous peoples across various nations worldwide [23]. Efforts directed at technology-based language preservation can be approached from three main perspectives: the scientific viewpoint, which includes computational linguistics; the technical angle, emphasizing signal processing and human–computer interaction and the humanistic perspective, which draws on ethnography and field linguistics [9, 33].

In recent years, a newer perspective has also gained momentum, emerging alongside Māori and Western-influenced collaborative models for preserving language and culture [34]. This approach is grounded in a business-oriented development framework, particularly within international development and telecommunications, focusing on language technology that supports development and the safeguarding of living heritage. This section outlines specific technology initiatives aimed at preserving language and culture [24]. It also addresses several unresolved ethical questions regarding the roles of intermediaries in this area, as well as various research domains that, despite their unlikely potential for significant profit, could offer considerable advantages to small language communities [21]. These discussions are essential for comprehending the complex relationships among technology, culture and language within indigenous communities and their lasting legacies.

Per the ILO 169, it is essential for indigenous peoples and governments to establish their own priorities to fulfill the ILO 169 objectives, with many indigenous communities viewing the preservation and promotion of their languages as a primary aim [35]. This endeavor, however, presents significant challenges, as these languages are often minority languages within their respective nations and are rapidly losing speakers for various reasons [10]. To address this issue, digital archiving and repositories have been implemented to gather, document and safeguard the ancestral knowledge of these communities, encompassing both language and culture [19]. These digital systems are specifically created to store, preserve, index and showcase artifacts, with metadata playing a crucial role in the discovery and accessibility of these items

[16]. The foremost benefit of digital archives and repositories lies in their ability to preserve and safeguard ancient knowledge and legends through digital conversion [17]. Utilizing speech processing techniques, language engineering applications can facilitate tasks such as indexing, browsing, information retrieval, speech synthesis and transcription [18]. Additionally, this knowledge allows for the regeneration of sound archives and text for training purposes, as well as providing language support for languages that are rarely documented, among other applications [36]. The primary focus in designing a digital archive for data preservation is ensuring that the data remains intact over the long term [15]. This comprehensive system comprises various elements, such as procedures for assembly and disassembly, analysis of device failures and recovery mechanisms, energy policies that can be implemented and considerations regarding the availability of technology, costs and the value of each step necessary for achieving enduring preservation [14]. Long-term preservation, as outlined in digital preservation design, can be categorized into several key classes, including digital timelines, data migration and preparing systems for new environments. Smaller datasets can be packaged and transferred to more resilient media, placed in sustainable settings like network-based or portable desktop magnetic disks, tape cassettes, backup CDs and DVDs, as well as servers related to software [37]. There exists a palpable fear among these individuals of losing their heritage and history, a concern that is justified given how drastically different their lives were compared to contemporary society [13]. Additionally, there are numerous ongoing research initiatives that involve both technology and human efforts, highlighting a robust demand for digital archiving [38]. Menschen is developing a digital archive intended to categorize and preserve various materials, including full texts, images, audio recordings, videos and websites in Swiss languages and dialects. As part of the initiative to design the Digital Oral Archive for Endangered Knowledge, the Association AIDA is contemplating the creation of digital archives [39]. Each category boasts a significant number of archives [12]. Additionally, the Library of Congress hosts numerous digital archives as well [11]. These archives are meticulously structured regarding their usage, digital formats and data descriptions [40].

5 Conclusion

Globally, there is a significant and increasing interest in indigenous peoples and their traditional or minority languages, as well as a related curiosity about how these communities utilize digital technologies. While this text acknowledges both areas of interest, it notably diverges from much of the existing literature that emphasizes the potential benefits of digital technologies for reclaiming indigenous languages. Instead, the primary focus here has been to investigate some of the risks associated with indigenous knowledge and understanding, as well as the languages that convey them. This is not to suggest that digital technologies lack the capacity to play a crucial and distinctive role in recording, preserving and maintaining indigenous knowledge

or languages, nor to imply that they cannot be effectively integrated into the transformation or revitalization of indigenous educational institutions. They certainly can. However, as demonstrated throughout this text, digital technologies—especially the internet—can facilitate the creation, dissemination, growth and strengthening of Universal Cultures, which possess the ability to significantly enrich the human experience as a whole through the diverse ways of living they offer and embody. The expansion of the Internet offers indigenous communities across various regions the opportunity to define and mold their distinct lives, conditions and cultures. Nevertheless, digital technologies inherently possess their own universalizing tendencies. This ongoing effort allows for the careful and proper management of these tendencies, which is essential to prevent any potential loss.

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The Influence of Automated Content Generation on Decision-Making Processes in Digital Media



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Abstract The objective of this study is to explore the impact of automated content generation (ACG) on decision-making processes within digital media channels, thereby opening up opportunities for content strategies, message encoding, and audience reception. While a significant driver of change in content creation is artificial intelligence (AI), ACG emerges as an effective and scalable solution for businesses, particularly in the realm of digital marketing. However, ACG introduces a transformative disruption to the established digital marketing paradigms, specifically in the encoding–decoding interactions between content creators and consumers. Employing a qualitative research methodology that incorporates both descriptive and analytical techniques, this study reveals the influence of ACG on decision-making processes. By examining the operations of digital agents, corporate strategies, and media characteristics, a clearer insight can be gained into how ACG reshapes the cognitive processes involved in content consumption, decision-making, and engagement. The results indicate a need for further exploration into the ethical, psychological, and strategic ramifications of ACG within digital media.

Keywords Automated content generation · Artificial intelligence · Decision-making · Digital media · Content strategies · Message encoding · Audience reception · Digital marketing · Cognitive processes · ACG

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1 Introduction

The emergence of artificial intelligence (AI) and its numerous applications is igniting discussions globally. These range from high-level concepts that evoke fears of a dystopian future to practical and promising results that seem just within reach. One significant impact of AI has been in the realm of content generation. For companies, particularly in digital marketing, content holds immense value: it leads to sales through the collection of leads that are eventually transformed into persuasive arguments by a sales representative [1]. However, content creation is labor-intensive and expensive, making it nearly unmanageable at a large scale. Indeed, Automated Content Generation (ACG) powered by AI—the enigmatic force behind the scenes that delivers personalized and extensive content at minimal costs [1]. Nevertheless, content generated by ACG strays from a comprehensive understanding of digital marketing's frameworks, including its content, impressions, results, and strategic decision-making. This study aims to explore how ACG influences the prerequisites for decision-making processes involving digital media, such as advertisements and web content [2]. Initially, an analysis will focus on digital agents representing organizations, emphasizing the various types of influencers. It will be demonstrated that, at elevated levels of corporate strategies, decision-making processes are even less deliberate than commonly perceived. This revelation calls into question the significant influence of the encoder in digital marketing communications, suggesting a more balanced power dynamic between encoder and decoder. By examining the largely uncharted territory at the intersection of macro-level (industry standards and regulations) and micro-level (messages) within corporate strategies, this study embarks on a new path to explore digital marketing content [3].

At the same time, the roles and inhibitors of content within ACG are examined. Messages that carry intentionality, such as instilling fear or showcasing empathy, are seldom conveyed, while trivial media, score-based games with addictive elements, and chatbots designed for conversation positively influence media. It is determined that content generated by ACG consistently offers fresh impressions, making it more exploratory than exploitative. This type of ever-feeding mechanism has the potential to reduce cognitive engagement and influence fundamental decision-making pathways in a meaningful way [4].

1.1 Research Significance

The study is important in that it investigates the impact that ACG has on the process of decision-making within the sphere of digital media, vital in the dynamically developing area of digital marketing in the modern AI-infused world. As companies scale up their investments into digital marketing, the undergirding role of content to drive audience engagement and shape brand perception (leading to sales) is critical and cannot be underestimated. By looking at the influences of ACG on

digital marketing strategies, the present study shows how AI-generated content influences the choices of organizations and consumer behavior. It also questions established relations between content creators (encoders) and their addressees (decoders), suggesting a more symmetric distribution of influence. Such a power-shift can make much difference in marketing strategies and how businesses engage with their target markets. The study further investigates how ACG, via its enormous potential to create huge volumes of individualized content at very low costs, changes digital marketing decision-making by reducing the cognitive burden on decision-makers and simplifying the process. Providing actionable insights that marry macro-level industry standards with micro-level messaging to help better understand countless uncharted territories of automatic content generation, this research delivers new perspectives for companies to reassess their approaches to decision-making in the digital age. New coordinates to be noted on our maps, freshly declared for automatic content generation, and troop movements to be reimagined in light of them.

1.2 Methodology

Qualitative research was conducted to examine how automatic content generation influences processes in decision-making within the digital media domain. This was done using a systematic literature review approach, employing a descriptive methodology in which scholarly articles, case studies, and industry reports that relate to the topic are described. This review critically examines present views on the impact of ACG on decision-making by looking at how it shapes content strategies, encoding messages, and audience reception through digital agents and ACG systems. Following the detailed descriptive analysis provided herein, the researchers switch to the analytical approach to interpret the findings and identify emerging patterns that might provide actionable insights into ACG's influence on processes of decision-making within the context of the digital media domain. This is how both methods combine to give a holistic view of how ACG affects decision-making within the domain of digital media.

2 The Evolution of Automated Content Generation

Automated content generation (ACG) is the process facilitated by computers that employs data-driven techniques of natural language processing (NLP) and/or text generation. This method produces texts for different media either completely or in part [4]. ACG was first introduced in a study conducted in 2013 and involves the automated construction of content by utilizing existing content, data, or information. The term signifies the capacity to write, generate, create, and publish texts with minimal dependence on human authors. ACG's range includes fully automated processes that do not involve human writers at all, as well as semi-automated processes where human

writers have designated roles, such as crafting content from a template or focusing on a specific subject area. As a machine-assisted and computational process, ACG shows diversity in how writing tasks are delegated to computers. It includes both intelligent systems capable of learning and adapting, as well as non-intelligent systems that maintain consistent usage and outcomes throughout practical applications [5].

The relentless digital transformation in communication and information technologies, as well as in the economy and daily life, poses an unparalleled and significant challenge for media and communications sectors globally [6]. Nevertheless, the rise of digitalization, with its profound impact on ACG marketing and distribution, has revealed extraordinary opportunities that not only improve efficiency but also fundamentally alter the nature of writing and communication tasks that were previously the exclusive realm of human authors [7]. As a result, intelligent systems, fueled by cutting-edge technologies like artificial intelligence and machine learning, emerge as viable solutions to the pressing threats confronting media organizations that adhere to traditional business and economic models, providing a crucial means for survival and growth in this swiftly changing environment. In this broader context, which includes both risks and opportunities, numerous factors and compelling justifications support specifically the emergence of ACG and its rapid adoption in journalism and news media. As we explore this captivating domain further, we observe a significant transformation in the dynamics of media production and consumption [8]. Propelled by progress in digital platforms, automated workflows, and, more emphatically, the demand for immediate access to customized content. The emergence of ACG technologies is breaking down those traditional barriers and limitations that have hitherto obstructed the flow of information. Ushering in a new era where news and narratives can be created, tailored, and shared with unmatched speed and accuracy. Additionally, ACG has become an influential asset in the fight against the widespread challenges of misinformation and fake news that continue to undermine the credibility of conventional media outlets. Empowered by real-time data analytics through intelligent systems, today's media organizations can easily surf through the turbulent information landscapes and securely fast-track the identification of wrong information to verify and unleash only the trusted and reliable content to the public [9]. This is a most vital deed that emanates not just trust issues for the media but their critical reconnection into the height of driving force behind the public dialogue and democratic processes. Additionally, embedding ACG technologies in journalism and news media could also be a way of transforming story-telling per se.

Thanks to the technological advancements that facilitate this kind of work, media professionals are able to tread on unventured dimensions of creativeness, fusing text, pictures, and videos with sound and interactive features to inspire and hold their audiences in ways never done before. The experiences created by ACG are the real impetuses for changing the future of journalism: the place where one stops being just a word-bag and where readers can finally start playing around with stories [10]. Far from revolutionizing the way in which content is produced and disseminated, the incorporation of ACG into journalism and news media opens an entirely new spectrum of avenues related to audience engagement and revenue creation. Because it provides personalized storytelling at the back end of experiences, media companies

are able to land more into relationship building for loyalty pull factors which open new revenue streams. As the distinction between content creators and consumers diminishes, ACG enables individuals to curate their content consumption, giving them the freedom to decide what to watch, when to watch it, and how to interact with it [11]. This transition toward user-focused experiences not only broadens audience reach but also generates significant opportunities for targeted advertising, sponsorships, and inventive monetization strategies, securing the viability of media organizations in an increasingly competitive environment [12].

The increasing adoption and spread of Automated Content Generation (ACG) within journalism aims to address two fundamental inquiries regarding this technology and the environments that influence it: Indeed, the historical and sociological progression, development, and dissemination of ACG can be traced through a timeline that highlights the early foundations of contemporary ACG, detailing advancements up to the distinct phases of creating and implementing "robo-journalism" and "automated journalism" as terms associated with ACG in the field [13]. A socio-technical viewpoint on the digital transformation within media necessitates an understanding of the social construction of this technology and its ongoing relevance, prompting consideration of broader societal implications. ACG has emerged as a revolutionary element in journalism, automating content creation and transforming the production and distribution of news. Thanks to progress in artificial intelligence and machine learning, ACG has become remarkably advanced, capable of producing high-quality articles, reports, and even news videos. This groundbreaking technology offers the potential to enhance the efficiency of news production, streamline processes, and lower costs for media organizations. Nevertheless, alongside its advantages, ACG also brings forth significant ethical and societal concerns [14]. The influence of automated journalism on the integrity of journalism, the importance of human journalists, and the possible erosion of human connection and empathy in news reporting are all elements that warrant thorough investigation [15]. As ACG progresses and advances, it is essential for researchers, journalists, and society collectively to assess its implications critically and navigate the intricate socio-technological environment it generates. By grasping the social construction of ACG and its wider societal effects, we can guarantee that this technology is utilized in a responsible manner that enhances the quality and integrity of journalism instead of undermining it.

3 Theoretical Frameworks for Understanding Decision-Making Processes

Humans frequently utilize various logical frameworks when faced with decisions. These frameworks assist in maneuvering through a range of thoughts and actions, ultimately leading to a satisfying conclusion. But how do these frameworks function? What makes one framework more appropriate than another? Why do we observe a

hierarchy among them? Different thought experiments can shed light on these questions. These inquiries are vital within the field of cognitive science, which remains relatively young. While unconventional models may seem appealing, this discussion will focus on a more traditional conceptual structure. This includes the differentiation between discrete and continuous decision paradigms, as well as the separation of rational and non-rational decision heuristics [16].

The conversation surrounding human judgment and decision-making is replete with numerous mentions of "biases" and "errors," highlighting the inherent flaws present in our cognitive functions [17]. Both academic and non-academic communities have thoroughly examined the policy ramifications that arise from acknowledging these biases, aiming to understand their extensive impacts. In some cases, it has been proposed that regulatory frameworks should be established to manage the use and dependence on automated decision-making tools, based on the premise that if human judgment is susceptible to biases, these same biases could infiltrate the algorithms and systems that drive these automated aids, potentially resulting in unfavorable outcomes [18]. On the other hand, an alternative viewpoint suggests that since policy regulations are crafted by people, they are equally vulnerable to biases similar to those found in individual judgments [19]. This perspective argues that incorporating automated decision aids into the decision-making process could help mitigate human biases, leading to more objective and fair decision-making outcomes. Such tools may contribute to creating a more level playing field, enhancing the fairness and improving the accuracy and dependability of policy decisions [20].

An alternative perspective on "bias" focuses on the concept of "lessons learned," suggesting that while initial judgments and decisions may not be ideal, they often "overshoot" or "underestimate" the true nature of reality, gradually leading to a more accurate comprehension over time [21]. This perspective carries significant implications for the deployment of automated decision aids. In particular, if human judgment at the outset is flawed, allowing the erroneous decision and its repercussions to unfold may be beneficial in scenarios where the policy model involves relying on automated decision aids that have yet to be calibrated. While the immediate costs of the erroneous decision might be high, they can yield crucial insights and expedite the development of more rational, unbiased perceptions over the long term [22].

4 Impact of Automated Content Generation on Decision-Making in Digital Media

The way information is processed, analyzed, and understood has been profoundly influenced by the rapid growth and widespread presence of digital media, creating a considerable challenge for decision-making. As online content has surged, attention has transitioned from traditional offline media to the continuous and expansive flow of digital communication that infiltrates every facet of our existence [14]. Nevertheless, the effectiveness of social choices and decisions still relies on an individual's ability

to adeptly navigate and interpret the complex semantic layers present within the data [23]. An intriguing yet unresolved area of research concerns how the evolution of media shapes decision-making, especially regarding the transformation of frames across both spatial and temporal dimensions. This intricate issue certainly calls for deeper examination and inquiry.

This study presents a new and holistic model aimed to address decision-making problems on multimodal content in fast-evolving digital media environments within frames. There are two major building blocks of the model: the significance of the content and the key effect of contextual frames [24]. In light of this complex problem, the authors have set up a dual global optimization model. The first one refers to identifying and pulling out the most important content from the large flow of media frames as a reliable reference for decision-making [22, 25]. This includes sophisticated frame representation using clustering approaches, a detailed analysis of decision complexity based on reference clustering, and initial content aggregation taking into account low importance [8]. Then, the second task of the proposed model performs an in-depth analysis regarding the features of influence and significance of contextual media frames of space–time context. This is done in a full-constrained spatio-temporal context. This complex analysis involves attention clustering and saliency modeling so that one can efficiently assess the cumulative decision impact of contextual media frames on the overall reference decision [9, 15]. Integrating these two tasks in the model for making decisions about multimodal content results in an efficient solution binding together the most important aspects of content importance and the influence of contextual framing [26]. The process of decision-making in the digital media environment is aimed to be turned on its head with careful optimization, sophisticated clustering methods, intensive analysis, which finally ends up providing better user experiences with meaningful content [13, 21].

The evaluation of the model took place during actual election campaigns in 2019 and 2020 in the UK and France, respectively [3, 4, 26]. A prototype system was developed to process multimodal frames on Facebook pages within the same time periods utilized for the analysis [19, 24]. The resulting decisions were validated and examined concerning reference decisions, types of media, features of influence, and the evolution of significant contextual frame influence over time. Decision-making is affected by the influence of contextual media frames, which depend on shifts in space and time related to the most impactful content [12, 17, 27]. Contextual frames emerging in the initial gaps of media-saturated time and space are more prominent in the processing of decision reference frames. A trade-off exists between the significance of content and the sophistication of media affecting decision resilience. When addressing parties with extreme polarity, visual framing has proven to be the most impactful on decision-making frameworks [7].

5 Challenges

The emergence of automated content creation across text, visual, and audio formats introduces significant ethical dilemmas. This chapter addresses the importance of transparency in revealing automatically generated content, the heightened visibility and possible dissemination of misinformation online, and the necessity for improved corporate accountability regarding its impact on personnel and resource distribution. Indeed, machine-generated content becomes increasingly common in public discourse, the demand for transparency regarding the application of these tools and the existence of generated material intensifies [27]. This is particularly crucial for websites and platforms that publish AI-generated content without any editorial oversight. Even when it is evident that a post is generated automatically, the awareness of control over the machines executing this task alters the audience's perception of the material [1, 2, 25]. This is similar to a viewer recognizing that a non-human entity created an artwork or portrayed a character, which affects the reception of that content. The amplified visibility, reach, and potential for misinformation surrounding online material require careful consideration. As more captivating forms of media, like podcasts and memes, gain popularity, the general comprehension of AI systems and their creative outputs remains limited. Older generations might approach the concept of "machine-generated" work with a cautious and skeptical mindset, rooted in a pre-digital perspective. In contrast, younger generations could readily accept the widespread mediation of culture, often unaware of the circumstances surrounding its creation and distribution [16, 23]. Therefore, it is essential to conduct future investigations into how automated content generation will influence public dialogue, media landscapes, culture, and the resulting misconceptions [10, 18]. The emergence of automated media reporting systems and their implications for news discourse need to be thoroughly examined [5]. This scrutiny has become increasingly vital, particularly considering initial worries about the impact of social media platforms on news content, such as restrictions on political and commercial expression, the rise of filter bubbles, and the development of systems that highlight and disseminate machine-generated material, including Google's AI-generated snippets [5, 20]. Such developments may foster competition among news organizations driven by clickbait headlines produced by machines, warranting an exploration of the potential effects of these systems on news discourse [11]. The investigation into taxation or penalties on machine-generated content should be pursued, given the premise that "The Majority of Users Would Not Have Interacted with the Content if it Was Known to be Automated" [11]. Consideration must be given to corporate accountability regarding the possible impacts of automated content creation systems on employees, resources, and workplace conditions. This raises concerns about layoffs, the redistribution of resources, and overall corporate responsibility. Additionally, there are further inquiries related to information from social media feeds and search engines, as well as an examination of the regulations surrounding automated content generation initiatives in both corporate and academic environments [6]. The manner in

which machines produce content in a climate of uncertainty about the accuracy of publicly presented information should also be scrutinized.

6 Conclusion

Since the advent of automated systems, the landscape of content creation has undergone substantial transformation. Increasingly prevalent in digital media, automated content generation now appears in various formats, including news articles, market analyses, sports summaries, and more. The public seems largely apathetic towards content produced by machines, with algorithms becoming integral participants in the realm of digital media. Whether the rise of this new form of content is beneficial remains a matter of debate. The potential impacts on the quality and structure of the emerging information landscape, which will ultimately influence audiences and users, warrant careful evaluation. While creating content manually can be expensive and has limited scalability, automated systems offer significant scalability advantages in theory. Concurrently, social network structures such as news hubs, blogs, discussion forums, and social media platforms are increasingly subject to manipulation through search engine optimization. The standing of digital media outlets within the information ecosystem is also affected by their structural design and popularity. The low-cost nature of text generation fits well with the current incentive models in digital media, where the creation of marginal content plays a crucial role. The rise of automated text generation is well recognized and has significantly contributed to ongoing discussions surrounding ethics and potential harms. For years, the realm of academic publishing has unwittingly incorporated text generation grounded in statistical analysis, where algorithms produce misleading citations and generate entire articles filled with nonsensical phrases. The current information environment is already adapting to the methods employed by machines to disseminate intentional misinformation and curate content that aligns with specific interests and agendas. The forthcoming stages relate to the landscape of decision-making processes as compared to that of content. While automated text generation systems replicate human decision-making, they do so in a distinct manner. On one side, the assimilation of what is "read" tends to create a cumulative effect, forming a sort of "mental budget" beyond which reasoning halts. Conversely, automated decision-making cannot be entirely separated from human influences and considerations. Additional steps will involve utilizing a variety of straightforward digital media elements prevalent in the digital landscape and observing discussions and interactions that occur later in the decision-making process.

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Psychological Well-Being in the Age of Connectivity: Examining the Influence of Social Media and Digital Interaction



Saed Salah Alfraih

Abstract The emergence of digital platforms and social media has sharply changed the nature of human relationships in the present world. Therefore, this research will try to find out how much these technological changes have affected human psychological well-being with a focus on social media and digital communication. While digital engagement can be viewed as an opportunity for mass communication, it raises relevant issues related to its effects on mental health. The research shall take a qualitative approach by using both descriptive and analytical tools for reviewing related literature that provides information on the relationship between online engagement and its impact on psychological outcomes. This paper critically looks at empirical evidence regarding social media's role from two angles: one that suggests it leads to isolation and another that argues it increases connectivity without considering what these mean for mental well-being. It also explores ways through which such tools can be put into practice within Arabic language teaching, hence narrowing the gap between modern technological advancements and traditional pedagogy. The findings are, therefore, very important for educators and policymakers in the formulation of technology-based strategies to enhance academic results and psychological well-being in a connected world.

Keywords Digital platforms · Social media · Psychological well-being · Technological advancements · Online engagement · Mental health · Digital interaction

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1 Introduction

In today's environment, the rise of digital platforms and social media has created new and unprecedented ways for people to interact and connect. The online world has expanded into a pervasive arena for communication, transforming how we engage with one another. While there are significant advantages to these digital interactions, concerns have been raised about their effects on individuals' mental health. A growing body of research aims to clarify the relationship between online engagement and psychological outcomes [1]. However, disagreements remain regarding the impact of social media on mental well-being. Some studies suggest that digital interactions lead to feelings of isolation, framing social media as a precursor to disconnection. On the other hand, another group of research argues that social media fosters a sense of sociability and connection, contributing positively to mental health. In light of these contrasting perspectives, this work seeks to explore the effects of social media on individuals' psychological well-being within the context of digital interactions, evaluating both the negative and positive aspects [1].

1.1 Research Objectives

The digital realm, which includes social media and interactive platforms, has become an essential component of daily life. While the digital landscape provides numerous advantages, there are clear challenges concerning individuals' mental health linked to social media usage. Reports indicate that many have faced negative psychological issues attributed to the effects of social media. Despite this, a body of literature has emerged highlighting the positive impacts of social media, particularly in terms of enhancing feelings of connection and social availability. This dissertation aims to address the well-documented demand for an unbiased investigation into the relationship between psychological well-being and the various touch points of connectivity, offering a review of the literature concerning the effects of social media on individual psychological dimensions.

1.2 Methodology

This research utilizes a qualitative design to investigate how technological advancements influence Arabic language teaching, with an emphasis on merging traditional instructional methods with modern digital tools. A descriptive approach is taken to analyze existing literature regarding the incorporation of technology in language education, specifically focusing on frameworks, empirical research, and case studies that illustrate the convergence of tradition and innovation in Arabic language instruction. Additionally, an analytical method is applied to integrate the

findings, pinpointing significant trends and implications for improving teaching practices. By exploring technology's role in promoting academic achievement and psychological well-being—especially concerning social media and digital interactions—this study seeks to offer meaningful insights for educators and policymakers. Ultimately, the research aims to enhance the understanding of how technological resources can be effectively employed to improve Arabic language teaching and learning while also addressing learners' psychological needs in a more interconnected world.

2 Theoretical Framework

Psychological well-being refers to a mental health state defined by the existence of positive emotions alongside the lack of negative ones. This concept includes attributes like resilience, optimism, a healthy self-image, life satisfaction, and a feeling of fulfillment. It goes beyond simple happiness, emphasizing intentional involvement in life's endeavors. In this context, positive psychology aims to not just address and prevent issues but also to cultivate and amplify psychological strengths and abilities.

Psychological well-being is generally understood in two primary frameworks: hedonic and eudaimonic [2]. Hedonic perspectives define happiness as the existence of positive emotions coupled with the absence of negative ones. In contrast, eudaimonic views argue that happiness cannot be fully encapsulated by a single definition; rather, it is perceived as a fulfilling, enjoyable, and meaningful way of life, attainable through the application of one's personal strengths or virtues. At its most comprehensive, psychological well-being is regarded as a journey in which individuals recognize their capabilities, chase what they value in life, and actively engage in their personal growth.

A substantial amount of research has indicated a link between psychological well-being and social media by exploring various positive outcomes tied to its use. These outcomes encompass, but are not limited to, the creation and preservation of social connections, social support, social identity, and social capital. Research suggests that individual connectivity via social media not only fosters the development of social relationships but also facilitates the upkeep of current ones [3]. Previous studies have demonstrated that social media serves as a valuable tool for obtaining social support during goal achievement and crisis situations, thereby enhancing psychological well-being.

While early research concentrated on defining social media's operational aspects and conducting empirical tests to assess their positive effects, subsequent studies highlighted the necessity of developing a framework to explain how social media contributes to psychological benefits. Humans inherently strive for various goals – whether they are individual or collective, essential or aspirational, materialistic or every day, as well as tangible rewards or more abstract elements that seek to define happiness and well-being. Across different cultures and nations, universally acknowledged goals and aspirations encompass survival, physical health, financial stability,

knowledge and education, relationships with family and friends, broader community connections, and a relatively elevated status concerning these needs, desires, and expectations [3].

Terms like well-being, satisfaction, and quality of life are frequently used to describe individuals' lives, incorporating both psychological and objective elements. PWB is an evaluative concept that considers the significance of specific personal traits and life aspects, as well as a broader view of overall material and psychological conditions. It pertains to how individuals perceive their quality of life through particular psychological dimensions, which either connect to various facets of life satisfaction or express emotions.

2.1 The Impact of Social Media and Digital Interaction

In the last twenty years, there has been a growing body of research concentrating on the rising influence of social factors related to internet usage. A key focus is on the developing equalities in relationships and the mixed feelings surrounding sociability within online environments. While online interactions can broaden an individual's social circle, they can also lead to exclusion, harassment, and a feeling of anonymity [4]. The involvement of multiple senses is significant: the more senses engaged in a relationship, the higher the likelihood of forming bonds, developing trust, and achieving emotional intimacy. Traditional face-to-face communication ranks highest based on the number of senses involved, followed by telephone conversations, photographs, and written correspondence such as letters or emails, with computer-mediated communication (CMC) coming in last. The absence of nonverbal signals—like tone of voice, facial expressions, and gestures—often termed "cues-filtered-out," in CMC can easily result in misunderstandings.

Although the disembodiment associated with CMC may foster alternative identities and social connections, its textual nature is perceived as a barrier to achieving the intimacy found in face-to-face interactions. As a result, it was anticipated that younger participants would report lower satisfaction levels with CMC and feel a diminished sense of social closeness. However, more recent research has highlighted a more nuanced social landscape. An increasing recognition of the dual potential of online interactions—both to strengthen bonds and to distract from them—has emerged, leading researchers to contend that not all forms of online engagement should be regarded as a deprivation of interaction [5].

A significant issue has emerged at the societal level regarding the widening gap in social equality tied to information technology. Increasingly, access to information and information technology is becoming essential for participation in society, with the successful utilization of these technologies anticipated to gain even greater importance in the future. One of the most apparent effects of the rising availability of the internet has been the explosion of various online services and networks that address a wide array of social, cultural, and informational needs. This situation has sparked

concerns that unequal access to information technology and services could exacerbate existing socio-economic disparities and participation inequalities. It is expected that the internet will primarily benefit privileged groups, while those already at a disadvantage may face further marginalization [5].

Surprisingly, there has been a notable lack of focus on the social ramifications of the internet concerning online communities, groups, and networks. The "race" in information technology is not merely about the quantity of access to information; it also involves social interaction and the evolution of social relationships and networks. As the internet becomes more integrated into supporting current activities along with their associated social connections and networks, it prompts inquiries about the potential for the internet to foster the development of new communities and networks.

3 Literature Review

The historical context of psychological well-being has been a subject of investigation, particularly regarding how shifts in lifestyles have influenced it. Ancient thinkers such as Socrates, Plato, and Aristotle engaged in discussions about happiness and the essence of living well. Socrates asserted that a good life stems from knowledge of the good, while Plato believed that justice and virtue were the sources of happiness [6]. Aristotle emphasized flourishing through the application of reason. In contrast, Epicureans pursued simple pleasures, whereas Stoics discovered happiness in a state of tranquility. During the Middle Ages, the notion of well-being evolved to include religious elements, with figures like Thomas Aquinas promoting the idea that true happiness is rooted in divine understanding.

Following the Renaissance, there was an increased fascination with happiness, particularly among thinkers such as Hobbes, who emphasized self-interest and the pursuit of material wealth. During the Enlightenment, philosophies emerged that promoted optimism and social contract theory; for instance, Rousseau argued that true well-being arises from living in harmony with nature. In contrast, Post-Modernism challenged overarching narratives, highlighting the importance of individual perceptions of reality.

The World Health Organization (WHO) defined well-being in 1948 as a condition of total physical, mental, and social health. The rise of social media in the late 1990s facilitated the sharing of user-generated content. MySpace emerged in 2003, marking the popularity of Web 2.0, followed by the launch of Facebook in 2004, which enabled users to create their own profiles. Current platforms increasingly blur the lines between online and offline interactions. Instagram serves as an expanding social space for young people, fostering emotional connections through images. Meanwhile, youth show a preference for visual platforms such as Snapchat and TikTok, which are characterized by their transient nature [6].

Basic psychological needs (BPNT) are influenced by digital connectivity. While sharing online fosters connections, the act of receiving likes can diminish satisfaction. Observing the joyful posts of others may lead to feelings of envy. The

mental co-location with technology can lower both motivation and satisfaction levels. The presence of devices and app usage negatively impacts face-to-face interactions. Additionally, multitasking with media reduces overall enjoyment.

The nature of well-being and its influence on various facets of human life are the focus of several theories. Hedonism, which prioritizes pleasure, results in increased happiness or contentment. Theories centered on preference satisfaction ensure that individuals' needs are met, whereas objective theories assert that certain things hold intrinsic value. Descriptive theories evaluate the comprehension of concepts, while explanatory models aim to provide causal explanations [7].

3.1 Historical Perspectives on Well-Being

The concept of well-being is complex and recognized across both Eastern and Western philosophical traditions. Thinkers from classical Western philosophy, including Aristotle, Plato, Socrates, and Epicurus, delved into the ethical and moral boundaries of happiness, redirecting the emphasis of well-being from external factors to the idea of happiness as a moral endeavor. Notably, Socrates underscored the significance of contemplation, thought, and self-regulation in averting moral deterioration. Meanwhile, Plato made a distinction between eudaimonia and hedonic pleasures, promoting the virtues of knowledge as foundational to true happiness. Epicurus, on the other hand, acknowledged the limitations of pleasure derived from hedonism, asserting that a fulfilling life necessitates prudence to steer clear of suffering and to seek higher forms of pleasure [7].

During the Hellenistic/Roman era, a refined evolution of the concept of eudaimonia is evident in the writings of philosophers such as Zeno of Citium, Seneca, and Cicero. These thinkers reinterpreted Aristotelian eudaimonia, crafting a Stoic perspective that asserts the existence of an independent and rational cosmic order that should guide an individual's life in a rational and practical manner. Eudaimonia thus emerges as an ideal characterized by "inner liberty" and "autarkia," embracing life's unpredictable events, controlling passions, and fostering spiritual freedom [8].

In contrast, Eastern viewpoints focused on the socio-political, religious, and moral aspects of well-being. Confucian and Daoist philosophies in China recognized that the sociopolitical climate could disrupt well-being, suggesting that a harmonious balance between one's inner state and socio-political circumstances could be achieved through moral cultivation. The Confucian concept of well-being highlights "Common-Affection," advocating for an extension of empathy towards all individuals, essentially promoting a universalist approach to self-cultivation that encompasses both moral and political elements. Conversely, Daoism offers a different perspective by advocating for the independent cultivation of personal desires and psychological states, separate from socio-political influences. Unlike the Western emphasis on self-determined happiness, the Eastern conception of happiness predominantly incorporates socio-political, moral, and relational dimensions.

3.2 The Evolution of Social Media

The rapid rise and emergence of the internet have sparked a tremendous surge in the number of social media platforms and websites. Applications driven by technology, including social networking sites (SNSs), blogs, chat rooms, and virtual worlds, have revolutionized how individuals communicate and interact with one another. Since 2001, the count of these interactive Web 2.0 platforms has soared from under 100 to more than 1000 by 2007. Present estimates suggest there are nearly 1 billion users actively participating in social media, predominantly within the age range of 14–25 years. Facebook, which stands as the largest and most popular social networking service both in America and globally, boasts over 500 million active users acquired in less than seven years [8]. This remarkable expansion of social media engagement has evolved into a defining "vehicle of daily life" for the younger generation. Nevertheless, what began as a fun and innocent pastime has raised significant concerns among parents, educators, school administrators, and community leaders both in America and worldwide. This apprehension stems from an increasing body of evidence suggesting that social media interaction may be linked to symptoms of a rapid and intensified decline in psychological well-being and adjustment.

In nearly 15 years of social media engagement, despite ongoing public concern and scrutiny from the media, there has been a surprising lack of empirical research aimed at assessing whether the rise of social technology-based interactions is linked positively, negatively, or not at all to the psychological well-being of a generation [8]. Much of the existing research focuses on descriptive analyses regarding who engages with specific facets of social media and in what contexts, rather than exploring the impact of social media usage on an individual's psychological development or its effects on adjustment and well-being. Therefore, comprehending the relationship between technology-driven interactions and psychological well-being has become both essential and significantly overdue. This understanding is vital not only for parents, schools, and policymakers but also for individual users of social media [9].

4 Psychological Well-Being

Psychological well-being represents a subjective and relative appraisal of one's life, encompassing emotional reactions to various life events along with an overall assessment of life as a whole. It can be characterized as a comprehensive evaluation that culminates in either satisfaction or dissatisfaction. Various factors contribute to psychological well-being, including gender, age, income, education, marital status, and social connections or networks. Individuals typically experience a high level of satisfaction in their life assessments, which positively impacts their behavior, motivates engagement in activities, and enhances benefits across social, personal, and relational aspects. Conversely, a concern for the well-being of others and significant

negative evaluations indicate dissatisfaction, resulting in adverse effects that hinder socio-economic progress.

The study of psychological well-being encompasses subjective elements like happiness and satisfaction linked to everyday experiences within the field of psychology. While much of the research tends to concentrate on negative factors, including loneliness and depression, there are researchers who explore the positive aspects, utilizing indicators such as leisure activities, optimistic outlooks, relationships with family and friends, and sexual fulfillment. This broader concept is referred to as life quality. Life satisfaction is viewed as the extent to which an individual's life aligns with their goals and desires [10].

The exploration of happiness psychology and subjective well-being serves as a crucial foundation for psycho-social understanding. Presently, there is an increasing concern regarding the negative impact of new information and communication technologies (ICTs), particularly social media, on individuals' psychological health. While social media can enhance social interactions and foster social capital through new online connections, it may also lead to social fragmentation and exacerbate socio-emotional difficulties among users [11]. Research typically targets teenagers and young adults, concentrating on issues like loneliness, anxiety, and depression. Most studies employ quantitative methods, such as large-scale surveys conducted online or in person; however, recent trends highlight the importance of qualitative analyses derived from interviews or discussions. This approach incorporates individuals' perspectives and experiences, thereby complementing and enriching the quantitative findings.

It is likely that the conceptual endeavor related to scientific understanding came before philosophical inquiries, as coherent viewpoints only emerged later. The initial investigations into social relationships and life assessment, encompassing both positive and negative emotions, fall under the realms of social psychology and the sociology of happiness, though they did not coalesce into a unified research domain [11]. The literature on subjective well-being, which addresses life satisfaction, happiness, and affect, provides a significant framework for understanding well-being. A more pronounced psychological viewpoint is evident in discussions surrounding quality of life, particularly within health and disability contexts. Terms commonly utilized in these areas include psychological well-being, emotional well-being, psychological health, and personal well-being, all of which pertain to an individual's perceived sense of satisfaction with the quality of their existence.

In contemporary societies, the significance of psychological well-being has risen, as there is an increasing acknowledgment of mental health being vital for optimal functioning and overall individual wellness. This multifaceted notion of psychological well-being signifies a favorable mental health state. Individuals' psychological and social well-being faces threats from prolonged stress, anxiety, and loneliness. Given the swiftly changing technological environment, comprehending the effects of constant connectivity on psychological well-being is crucial [12].

The definition of psychological well-being can take on multiple forms, with different theoretical frameworks highlighting various dimensions or elements. These

can be categorized into two main types: hedonic and eudaimonic. Hedonic viewpoints concentrate on emotional experiences at the moment, typically prioritizing the existence of positive feelings and the lack of negative ones. In contrast, eudaimonic perspectives encompass a broader understanding of well-being, extending from immediate encounters to individuals' long-term self-assessments and goals related to personal development, functioning quality, and engagement with others or society.

Psychological well-being is often defined as the lack of negative or distressing emotions, such as stress, anxiety, and depression, that individuals experience in response to various encounters [13]. Nevertheless, the absence of these distressing feelings is not a necessary condition for achieving psychological and social well-being. Personal disappointments and trivial matters can still negatively impact the quality of daily interactions and social inclusion, as well as lead to feelings of unhappiness or dissatisfaction. This highlights the necessity for a more comprehensive understanding of psychological well-being. Conversely, prolonged and excessive positive emotional states in individuals can potentially jeopardize psychological well-being. Thus, it is essential to view psychological well-being as a complex construct that encompasses its presence or absence, integrating various levels of human functioning and different temporal contexts [14]. A comprehensive understanding of psychological and social well-being involves recognizing individuals' enduring positive self-assessments concerning their interactions at the personal level, with others, and within their broader surroundings. This understanding ultimately influences their feelings of acceptance, satisfaction, or happiness related to the quality of their lives and social environments.

5 Social Media and Digital Interaction

The rise of the internet has transformed communication, enabling unparalleled connectivity for millions globally. Specifically, social networking platforms have altered the way people develop friendships and relationships. Unlike the personal connections established through in-person meetings, letters, or phone conversations, modern friendships frequently initiate online. By signing up on a specific platform, users can engage with numerous individuals all in one place. A variety of sites focus on different interests, such as family-oriented platforms, movie enthusiast communities, and dating services, appealing to a broad spectrum of users. This paper will explore how social media influences social interaction and development in relation to overall psychological well-being, assess the impacts of digital communication specifically, and analyze how psychological health may be influenced—either positively or negatively—by factors like age [14].

In the interconnected landscape of today, forms of digital grassroots social interaction are both vital and widespread. Platforms like Facebook, Twitter, Instagram, and Snapchat foster continuous engagement, allowing users to share images, comments, and various media. These sites create a sense of involvement and belonging, enabling

individuals to respond to their friends' updates. This type of interaction can hold particular importance for those who experience loneliness or social anxiety, as they may find it challenging to establish and sustain personal connections [14]. Users have the flexibility to engage on their own terms, transcending barriers of time, distance, or location. Nevertheless, participating in social media can result in detrimental self-comparisons, anxiety about how one is perceived, unwanted judgment or scrutiny, and misinterpretation of motives. Such challenges can lead to psychological distress and exacerbate existing mental health conditions, especially among vulnerable populations. While online social engagement has the potential to enhance psychological well-being, it may also yield negative consequences and intensify symptoms of psychological disorders.

Engaging with content produced by peers can enhance feelings of belonging and inclusivity, thereby improving psychological well-being through a sense of connectedness and relatability. However, within this realm of positive interaction, it is crucial to understand the potential negative impacts. Despite active social conversations and the promotion of reciprocal communication, the use of social media consistently involves passive consumption in an environment saturated with digital content. Constant exposure to updates from a wide and varied demographic can lead to unfavorable self-comparisons [15]. Users may find their own image evaluated against the posts they see, leading to extensive social comparisons. Such discrepancies can result in distress, as illustrated by a study linking Facebook usage to feelings of unhappiness. Additionally, the tendency to "like" on Facebook may reinforce negative perceptions of a target's image, implying a lack of popularity or acceptance [16].

5.1 Types of Digital Interaction

A proposed typology categorizes networked interaction into three primary forms. The first is social interaction, where the shared content is inherently social and can encompass various social networks like Facebook and Twitter. The second form is professional interaction, which centers on knowledge sharing or career advancement, often utilizing platforms such as LinkedIn, ResearchGate, and academia.edu [15, 17]. Lastly, entertainment interaction involves content intended for amusement, covering playful, informal, or fun activities, including videos, games, trending topics, and memes. Additionally, two sub-types emerge from these main categories: indirect social interaction, where an individual engages with a network of people through resources created by a third party after establishing a social connection, and collective social interaction, which involves a group of individuals discussing a common subject or topic in a supportive manner. Alongside defining these interaction types, the study also explores social media usage concerning intensity, application, and subject matter. Ultimately, it investigates the correlation between the intensity of digital interaction and psychological well-being across five dimensions: self-acceptance, personal growth, purpose in life, positive relationships with others, and environmental mastery [18, 19].

The findings of this study reveal that over half of the adult users who have engaged with social media platforms in recent months utilize multiple forms of digital interaction. Among these platforms, Facebook stands out as the most common for social engagement, whereas LinkedIn and ResearchGate serve as the primary venues for professional interactions [20, 21]. While YouTube and other content-driven platforms are significant for entertainment purposes, the majority of social networking sites utilized by individuals encompass at least two varieties of digital interaction. Additionally, the research indicates an increasing level of digital engagement among younger generations. This observation questions the deterministic perspective on generational behavior, pointing to a more adaptable situation regarding technology usage and highlighting the potential for further investigations into the motivations and experiences of different age groups.

5.2 Positive Effects of Social Media and Digital Interaction

In recent times, the Internet of Things (IoT) and social media have emerged as integral parts of everyday existence for individuals worldwide. With just a click on a post or a tap on a screen, people can share snippets of their personal lives with friends, family, and even total strangers [21, 22]. These actions can be analyzed through various perspectives: legal, political, social, and perhaps most crucially, psychological.

A National Study on Understanding and Providing Psychological Well-Being through Social Media and Text Communication reveals that the swift advancement of technology and the prevalence of social media encourage individuals to utilize resources like social networking sites (SNS) and text messaging to improve their psychological well-being [21, 23]. Engaging with these platforms can foster a sense of belonging and social connectedness, which may alleviate social anxiety and psychological distress. Consequently, this engagement can lead to the development of a personal social network that serves as a benchmark for social comparison. However, this cycle can also lead individuals into social exclusion, resulting in a decline in psychological well-being—a detrimental loop. The study identified conflicts associated with different types of usage, highlighting both beneficial and harmful effects on psychological well-being. Therefore, users need to be aware of strategies that allow them to engage with socially connective resources while minimizing the risks of social exclusion. It is essential that support and education are integrated into the outreach efforts of social networking sites and IoT resources, as leveraging these tools is highly encouraged to promote social inclusion [24].

Facebook stands out as one of the primary categories of social networking platforms. Users turn to Facebook for numerous purposes, including fostering social connections, sharing information, seeking entertainment, and understanding the implications of various issues [25, 26]. However, excessive use of social networking sites may be linked to a range of adverse life outcomes, such as diminished academic performance, lost productivity, and fewer social interactions. Additionally, we are currently experiencing a significant period of social transformation driven by rapid

technological advancements and widespread shifts in societal values. An increasing body of research has emerged regarding the impact of social media and smartphones on different demographic groups and age ranges. It has been revealed that activity on confession pages is strongly associated with social media usage, which plays a role in forming peer relationships, fostering social acceptance, and influencing social anxiety, enjoyment, and leisure pursuits.

5.3 Negative Effects of Social Media and Digital Interaction

While there are many benefits associated with social media and digital interactions, they also bring forth significant risks to social, mental, and emotional health. The reasons to step back from social media use outweigh those for continuous engagement. Daily exposure to countless posts, images, and tweets can render these visual experiences counterproductive. Rather than fostering joy and showcasing ideal moments, social media content can contribute to feelings of anxiety and depression. Observing a seemingly perfect world for others can lead to feelings of judgment and self-criticism, resulting in a reluctance to share openly [27]. Social capital becomes tightly bound within specific groups [26, 28]. As individuals connect with like-minded peers, they often find themselves ensnared by rigid moral standards, where freedom of expression is overshadowed by harassment and apprehension.

The main avenue through which social media influences symptoms of anxiety and depression is social comparison. Particularly, upward comparisons can result in discouragement and negative emotions [29]. When individuals encounter others who appear to be better off, it accentuates their own sense of disadvantage. Although social media and digital interactions do not completely eradicate feelings of loneliness and isolation, they can often amplify these sensations [19]. Negative emotional health consequences are produced by Facebook. As expected, social media-induced paranoia can wreak significant havoc [21, 30]. The images shared on others' profiles lead individuals to question their self-worth and fear being judged by others [26].

Happiness may also serve as a detrimental snare. Whether through sharing cheerful images on platforms like Instagram or Facebook, an individual's sense of well-being is only as stable as the smile they present online [30]. A fleeting thought can spiral into a relentless series of intense posts, dredging up unusual moments and individuals from the past. This perpetual observation and voyeurism exacerbate feelings of anxiety. Another person's life is no longer a private domain; it becomes disjointed—comprised of travel snapshots, quotes, and changes in relationship status—forming a composite Google map where every action is tracked by a critical blue dot trail.

6 Conclusion

The widespread emergence of digital platforms and social media has led to a range of opinions and viewpoints regarding their role in daily life. Although these platforms have connected individuals in unprecedented ways, many people today report feelings of loneliness, increased narcissism, and general dissatisfaction with society. These contradictory insights have sparked an investigation into how social media affects psychological well-being. In a broader sense, psychological well-being can be defined as the condition of individuals or groups who, amidst changing circumstances, think, feel, and behave in ways that promote their ambitions and self-fulfillment without causing harm to others. The necessity of exploring the link between social media usage and psychological well-being has been emphasized from a societal perspective.

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Analysis of the Legal Framework for Electronic Contracts: Challenges and Opportunities



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Abstract The objective of the chapter is to examine the legal and technical challenges associated with electronic contracts in today's digital landscape. It emphasizes the identification of key obstacles that electronic contracts face, such as the necessity of fundamental components to guarantee their validity and effectiveness, as well as issues related to cybersecurity, electronic signatures, and the protection of personal data. Utilizing a descriptive methodology, the study explored the legal and technical frameworks concerning electronic contracts across various countries. The findings revealed that existing legal structures do not consistently keep pace with swift technological advancements, highlighting the need for continuous legal modifications. Additionally, the results pointed out that legal processes concerning disputes over electronic contracts tend to be intricate and prolonged, which adversely impacts the enforcement and safeguarding of rights. A notable lack of legal awareness among both businesses and individuals regarding the management and protection of electronic contracts was also discovered, underscoring the necessity for training courses aimed at enhancing legal awareness. The study advocates for the revision of current legislation to align with technological progress and suggests enhancing the application of digital documentation methods, such as electronic signatures and encryption, to ensure contract validity and to protect against tampering.

Keywords Electronic contracts · Cybersecurity · Electronic signatures · Personal data protection · Legal legislation · Digital technology · Digital documentation · Encryption · Legal disputes · Legal awareness

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1 Introduction

The Internet has emerged as a key platform for finalizing various types of contracts due to technological progress and the proliferation of contemporary methods, which streamline processes and minimize geographical barriers between parties involved in contracts. Nowadays, both individuals and businesses can conclude agreements from far-off locations through the global network, thereby conserving time and effort while alleviating the complications associated with travel. This functionality has paved the way for the evolution of electronic contracts, positioning them as a viable substitute for conventional contracts.

In conjunction with this advancement, various legal and technical inquiries concerning electronic contracts emerge. For instance, must the intent in electronic contracts be clearly stated, or can it be inferred from actions or even silence? How do factors such as timing and location of contract formation factor into the digital landscape? What capacity-related concerns arise in electronic contracts as opposed to conventional ones? Furthermore, what difficulties are linked to electronic performance and the means of proof in this framework?

Considering these inquiries, the present study intends to delve deeply into these matters and examine their legal and technical structures by categorizing them into various branches. The objective is to offer an extensive perspective on managing electronic contracts, identifying potential challenges, and suggesting actionable solutions to enhance the legal and regulatory landscape in this domain.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the concept of electronic contracts and identify their key elements.
- Explore the legal challenges related to electronic contracts in different contexts.
- Assess the effectiveness of current regulations in protecting contracting parties in electronic contracts.
- Provide recommendations for improving the legal framework related to electronic contracts.

1.2 Study Methodology

To accomplish its goals, the study employed a descriptive methodology. Data concerning electronic contracts were gathered and examined from a variety of sources, including legal legislation, judicial rulings, and prior research. This approach was utilized to analyze and describe the existing state of legal frameworks governing electronic contracts, pinpointing current challenges and opportunities within this

domain. A detailed examination of legal literature and contemporary practices in Jordan, the UAE, and other nations was carried out to underscore significant issues and dominant trends in the regulation of electronic contracts. Through the application of this descriptive methodology, the study seeks to offer well-informed recommendations for enhancing legal frameworks and procedures associated with electronic contracts, grounded in a comprehensive analysis of the findings and data.

2 Electronic Contracts

An electronic contract is described as "a contract that entails the exchange of messages between the buyer and seller, utilizing pre-prepared forms and processed electronically, thereby establishing contractual obligations" [1]. In the Electronic Transactions Law, it is evident that while the legislator did not provide a definition for the electronic contract itself, Article 2 describes electronic transactions as "transactions executed through electronic means" [2]. In a similar vein, the UAE legislator outlines electronic transactions in Article 1 of the Federal Decree-Law on Electronic Transactions and Trust Services, defining them as "any transaction that is concluded, executed, provided, or issued entirely or partially electronically, including contracts, agreements, and other transactions and services." [2]

Jurisprudentially speaking, it is characterized as "an agreement in which the offer and acceptance are conveyed through an open international network utilizing both audible and visible methods, facilitated by the interaction between the offeror and the offeree" [3]. Additionally, it is portrayed as a contract wherein the offer and acceptance transpire through an international communication network that employs electronic data exchange, aimed at establishing contractual obligations.

Several characteristics define these contracts. To begin with, they are formed in a virtual contract forum, indicating that one of the parties involved is not present during the meeting, and the agreement is established online. Consequently, the parties do not convene in a single location; a genuine forum requires both parties to be physically together. For instance, when an individual in Jordan makes a purchase from an online retailer based in China, the transaction occurs without the two parties meeting, which renders the contract forum virtually hypothetical due to the absence of one party and the online nature of the agreement. While electronic contracts share the same subject matter as traditional contracts, they differ in how they are concluded. Both types aim to establish contractual obligations and allow the consumer to acquire the desired product, regardless of whether the transaction occurs through conventional or electronic means [4].

Thus, the distinction is found in how conclusions are reached. Unlike traditional contracts that require a physical setting for both parties to meet, electronic contracts are finalized over the internet. For instance, purchasing a watch at a physical store exemplifies a conventional contracting method, whereas if an individual sees an advertisement for the watch from home, requests to buy it, and finalizes the contract

without a face-to-face meeting, this illustrates the electronic approach. Furthermore, electronic contracts frequently encompass a commercial consumer dimension, usually taking place between traders and consumers via the network. Most agreements made through online retailers involve the store owner and the consumer, with the store showcasing products and services aimed at individuals of all ages. Numerous online shops provide items such as toys for children, clothing, books, and various other products targeted at younger audiences [5–7].

Contracts of this nature are deemed international because they can be established between entities in various countries, frequently involving parties that are unfamiliar with one another. For example, individuals globally can make purchases from "Modanisa" without any direct knowledge of the store owner, visiting the physical location, or having personal interactions, opting instead to buy through an intermediary. Transactions in electronic contracts are processed electronically, utilizing a range of payment methods, including credit cards [8–11].

One of the benefits of utilizing the internet is the ability for individuals to acquire any desired product or book services at any hour. Shoppers can enter an online store, choose the necessary items, and finalize the purchase and payment with a credit card, all without needing to visit a physical location [12]. Additionally, a notable characteristic is that electronic contracts are executed through digital means. As these agreements are formed online, their fulfillment also occurs via the internet, eliminating the requirement for the parties to be physically present [13]. For instance, when a person purchases a specific item from an online retailer and confirms the transaction, there is no need to visit the store to collect the product; instead, the store delivers the item directly to the individual's home or any preferred address [14–17].

When standard contracts featuring predetermined conditions are employed, and the offeror does not permit any negotiation, it qualifies as a contract of adhesion. In contrast, if the contract is formed through dialogue or by employing either auditory or visual methods, it is regarded as consensual [18].

The classification of these contracts as consensual is supported by the researchers; however, certain agreements may be viewed as contracts of adhesion when the product is both essential and monopolized, thus forcing the consumer to accept the terms without any alternatives. For example, when an online retailer promotes travel services and provides a standard contract containing all predetermined terms of the trip, the consumer is left with the option to either accept or reject these terms, without the ability to negotiate. In such scenarios, if the product is both essential and monopolized, it aligns with the modern understanding of a contract of adhesion. On the other hand, if there is a phone conversation aimed at grasping the individual's preferences and terms, leading to mutual agreement, the contract would then be deemed consensual [18].

3 Issues Related to Electronic Contracts

Electronic contracts, irrespective of their content, are classified as remote contracts, indicating that they take place between parties situated in different locations. This situation prompts inquiries regarding the legitimacy of the alignment of contractual intentions through electronic platforms and the assignment of each intention to its respective owner. This topic will be examined in this section [19].

3.1 Issues Related to Will

Like any other contract, an electronic contract necessitates the expression of will from an individual who possesses the legal capacity to do so. Will is characterized as "the determination to perform the legal act subject to the contract, and the expression of contractual will is made using a means that indicates its existence" [20]. There are two categories of expressions of will: explicit and implicit. An explicit expression refers to "the direct expression of will through a direct appearance, which can be through writing, speech, signs, or any stance that leaves no doubt about the intent to create a legal effect" [20]. According to Article 93 of the Civil Code, "Expression of will may be through words, writing, customary signs, even by a mute person, and by any other act that leaves no doubt in the circumstances indicating consent" [18, 21].

Implicit expression, in contrast, is conveyed indirectly and inferred from an individual's actions, even when their intention is not overtly stated. This can occur when a person undertakes an action that does not explicitly demonstrate their will but is interpreted as such. The issue arises regarding whether silence in contractual relationships formed through electronic stores constitutes a manifestation of will and if it can be regarded as a declaration. Generally, both law and jurisprudence have determined that silence may be viewed as acceptance in certain exceptional circumstances. This understanding is reflected in Article 95 of the Jordanian Civil Code and Article 135 of Federal Law No. (5) of 1985 regarding the Issuance of the Civil Transactions Law, where both Jordanian and Emirati legislators are in agreement. As stated in the Jordanian Civil Code [22–28]:

1. Silence does not imply consent; however, silence in the need to clarify is considered acceptance.
2. Silence is considered acceptance, particularly if there has been previous dealings between the parties, and the offer relates to this dealing, or if the offer results in a benefit for the addressee.

The Court of Cassation's ruling is also evident in judgment No. 1578 of 2023, which states: "Silence is considered acceptance, particularly if there has been previous dealing between the parties" [29]. In a similar vein, ruling No. 453 of 2022 indicates: "The silence of the defendants regarding the contents of the email

sent by the petitioner is considered an acknowledgment of its contents" [30]. Additionally, the Emirati legislator addresses this matter in Federal Law No. (5) of 1985, specifically Article 135, which articulates [31–34]:

1. Silence does not imply consent; however, silence in the need to clarify is considered acceptance.
2. Silence is considered acceptance, particularly if there has been previous dealings between the parties and the offer relates to this dealing, or if the offer results in a benefit for the addressee" [20, 35].

However, legal scholars are divided regarding whether silence can be considered acceptance in electronic contracts, with three main opinions [36–39]:

1. The initial viewpoint completely dismisses the notion that silence can be interpreted as acceptance in electronic contracts, contending that it cannot be likened to traditional acceptance because of inherent differences. In traditional agreements, the parties engage in direct physical interactions, while in electronic contracts, their contact is solely virtual through the internet. Silence in the context of electronic contracts may not genuinely represent the true intention, as it could stem from a technical glitch or an error.
2. The viewpoint of the second opinion regards silence as a form of acceptance in electronic contracts, akin to its role in traditional contracts. It contends that the method of contracting, whether electronic or otherwise, does not influence the principle of silence as acceptance, and that the customs relevant to traditional contracts should similarly extend to electronic agreements [40].
3. The third and dominant viewpoint adopts a balanced stance by not interpreting silence as consent in electronic contracts, with one exception: when there has been prior interaction between the parties, which frequently occurs in online transactions.

The researchers posit that traditional contracts in Jordanian and Emirati civil laws allow for implicit expression of will, a principle that should extend to electronic contracts when the criteria for valid will are satisfied. Nonetheless, silence ought to be interpreted as acceptance only within the framework of prior transactions, particularly when it favors the consumer, as this approach is fairer to the offeror, given that silence signifies consent based on past interactions [1, 41].

Contracts executed electronically, whether pertaining to goods or services, are classified as remote contracts. This classification prompts inquiries regarding the legitimacy of the meeting of wills in online marketplaces and the assignment of each will to its respective owner. Consequently, the examination will center on how will is expressed through the internet and electronic stores, while also considering the offer and acceptance from both parties involved.

An electronic offer, applicable to both traditional and electronic contracts, requires initiation by one party and acceptance by another, ensuring alignment regardless of whether the interaction occurs in person or remotely. Does this principle extend to sales contracts made through electronic stores, considering the distinct characteristics

of these agreements? Can the established guidelines for offers in conventional formats be utilized in this novel expression of intent? [21, 42].

In order to address these inquiries, it is essential to explore the idea of electronic offers, along with their stipulations and modes of expression. An electronic offer can be described as "a remote expression of intent facilitated through contemporary communication technologies, encompassing auditory or visual methods, or a combination of both, and incorporates all fundamental conditions and components of the proposed contract, ensuring that when it corresponds with acceptance, a contract is established" [43].

For an electronic offer to be considered valid, several criteria need to be fulfilled: it should be clear and precise, unconditional, aimed at specific individuals, and definitive—indicating that the offeror's commitment to the offer is unmistakable. It is essential that the offer is presented in a clear electronic format to eliminate any ambiguity. Electronic offers can be communicated through email or online stores. When sent via email, it functions similarly to a conventional offer made by post or fax, adhering to the standard rules governing offers [44].

When an offer is presented via electronic stores, its limitation lies in the quantity available rather than a time constraint. The product must be clearly identified, detailing the price and all necessary elements of the contract, and it should be aimed at the public rather than a specific individual. In such instances, the offer is deemed complete if it satisfies the general conditions [45, 46].

Consequently, an email offer is unequivocal and straightforward, while an offer presented through electronic stores typically serves as a request for negotiation and does not legally bind the offeror. In contrast, an email offer is aimed at particular individuals, necessitating enhanced trust and security in electronic transactions [47].

Problems can occur if the offeror finds out that the acceptor is unable to make the payment after the contract has been finalized, or if the seller fails to meet their obligations, like delivering the product. This situation can also harm the reputation of the electronic store.

To prevent these problems, the researchers recommend establishing electronic centers that focus on particular customer segments for advertisements from the electronic store (offer). This approach guarantees that the advertisement is directed toward those who are more likely to be interested in the product or service, shielding the store from the rising number of contracts worldwide and ensuring that consumer financial capabilities align, which enables the seller to more effectively manage their sales and financial standing [42, 48].

Acceptance of electronic contracts relates to the fundamental components outlined in the offer and must occur without any reservations; otherwise, it will be viewed as a new offer. In transactions conducted through online stores, acceptance must take place remotely over the internet and possess the same attributes as the electronic offer [49].

Electronic acceptance is characterized as "a manifestation by the recipient of the offer, using an electronic means, indicating agreement to the contract terms outlined in the offer" [50]. For acceptance to be valid, it must occur while the offer remains

open; otherwise, it will be viewed as a new offer. In the realm of e-commerce, acceptance should happen within the timeframe set by the offeror, such as a 24-hour product discount, where any purchase made during this duration constitutes acceptance. Once this period expires, it transforms into a new offer. Furthermore, acceptance needs to align with the offer, not only in terms but also in substance, ensuring that all significant issues are mutually agreed upon, and it must be communicated clearly, whether through verbal means, phone calls, or conversations [6, 7].

Concerning the consumer's right to withdraw, certain legislations, including Article 6 of the European Directive, grant this right, enabling consumers to withdraw without justification within a seven-day timeframe. Indeed, if the necessary information is not supplied, this period can extend to three months. However, in the legal frameworks of Jordan and the Emirates, there is no explicit provision for such a right.

The researchers hold the view that the lack of such a right within Jordanian and Emirati law is advantageous, as it prevents a blatant infringement of the principle of contractual equality, which might negatively affect the seller's financial standing and stock levels. The characteristics of commercial activity necessitate that traders conduct transactions aligned with their financial capacities, and a consumer's decision to withdraw could greatly influence the seller's financial health and inventory control [25–28].

3.2 Issues Related to Capacity

Capacity is characterized as "the ability of a person to have rights and obligations, and their capacity to exercise these rights and obligations" [51]. Consequently, the unique characteristics of concluding e-commerce contracts through online stores allow for agreements to be made with either a natural or legal person who may be incapacitated or face legal limitations, which cannot be disregarded. For instance, due to the rise of the Internet and the accessibility of electronic devices across various age demographics, a minor lacking capacity or an individual with restricted capacity could establish an online store and solicit purchases amounting to significant sums. Once their guardian learns of this, they might refuse to accept the goods, resulting in potential harm to the store owner who acted in good faith [9].

In traditional contracts, confirming the capacity of the contracting party is straightforward, as it involves checking identity cards and can be done in person where both parties are present. In contrast, e-commerce contracts conducted through online stores take place remotely, involving natural or legal persons who are not located together, which complicates the process of verifying the identity of the contracting party. Consequently, engaging in transactions via online stores necessitates that the contracting party perform due diligence to ascertain the identity of the other party, ensuring that the electronic contract holds validity, similar to any conventional contract. It is crucial to verify the other party's capacity to finalize the contractual relationship [10].

The increase in capacity problems on the Internet is worsened by the surge of online retailers, as individuals can now establish online stores and engage in contracts despite lacking this essential prerequisite for those with restricted capacity. Moreover, confirming the identity of the party involved in the contract poses difficulties; even when an identity is provided, there is no assurance that the individual is the legitimate owner of that identity or that it isn't associated with a family member or friend [11].

3.3 Issues Related to the Venue and Date of Contract Drafting

The determination of when and where electronic sales contracts are finalized has sparked significant discussion and varying viewpoints within legal theory. Specifying the time of contract formation is crucial because it marks the point at which the offeror loses the ability to withdraw their offer [15].

Given the significance of confirming the validity of electronic contracts, the researchers recommend the adoption of an electronic authentication procedure. This process entails engaging a neutral third party, one that both parties trust, to authenticate the identities involved in the electronic contract [16]. Consequently, this approach allows each party to ascertain the identity of the other, empowering the consumer to share all necessary information and data with assurance while ensuring that the merchant verifies the complete capacity of the other party [29, 17].

Each party has the ability to withdraw their acceptance of the offer, provided that the contract has not been finalized, leading to variations in the issue across different legal systems [36]. This moment is significant because it marks the point at which the contract starts to take effect and establishes the relevant law pertaining to the contract's duration [37]. Additionally, it is crucial for defining the statute of limitations for obligations that stem from the contract [48].

Although this matter has held considerable significance for legal theory, the judiciary, and the broader realm of contracts, it has grown increasingly intricate in the context of electronic contracts formed via online retailers [38]. It stands out as one of the most crucial and complicated legal challenges associated with this contract type [39]. Most legal systems have not provided a clear definition of this issue, resulting in varying national interpretations. Additionally, the international aspect of online store contracts adds another layer of complexity to the situation [49].

A pertinent question emerges: At what point can we declare that an electronic contract has been finalized between the parties involved in online store transactions? To address this inquiry, we will explore the theoretical viewpoints that have developed on this topic. Legal theory presents four distinct theories applicable to contracts formed through online stores, each indicating a specific moment when the contract can be considered concluded [50].

Theory of Acceptance Declaration.

A contract is established the moment the acceptance is communicated to the offeror; specifically, a corresponding acceptance to the offer creates the contract, irrespective

of the offeror's awareness. For the contract to be formed, it is enough for the offeree to declare the acceptance at the time and location where it is proclaimed [6].

Theory of Dispatch of Acceptance.

Advocates of this theory stipulate that, alongside the acceptance declaration, the acceptance must be sent, either by putting it in the mailbox or by notifying a messenger. This establishes the contract at the moment and location where the acceptance is sent or dispatched, necessitating a tangible act of sending to render the acceptance final and irrevocable once it has departed from the offeree's possession [7, 20].

Theory of Delivery of Acceptance.

This theory posits that a contract is formed at the moment the acceptance message arrives and is within the actual control of the offeror, regardless of whether they have yet become aware of its receipt. Thus, the contract is finalized when the acceptance reaches the offeror [51].

Theory of Knowledge of Acceptance.

A contract is established when the offeror becomes aware of the acceptance by examining the message that conveys it, since acceptance reflects an expression of will and takes effect only upon the addressee's awareness [9, 30]. Despite significant jurisprudential variations, the inquiry persists: At what point can we assert that a contract has been formed between the parties in an international electronic agreement via online stores, considering that each nation adheres to a distinct theory?

The researchers assert that the agreement between contracting parties should dictate the timing of contract formation in order to prevent conflicts among nations. While some adhere to the theory of knowledge of acceptance, others subscribe to the theory of delivery of acceptance or the theory of dispatch of acceptance. Given that many electronic contracts formed through online stores possess an international nature, it is essential to leave this matter to the individual agreement of the contracting parties for each contract to mitigate these discrepancies.

4 Conclusion

Electronic contracts play a crucial role in today's business landscape by streamlining and expediting the contracting process between parties online. As reliance on these contracts grows, there is an immediate necessity to establish the legal and technical frameworks that regulate them, ensuring their security and effectiveness. Findings from this study indicate that existing legal frameworks require ongoing updates to keep up with swift technological advancements and to safeguard the rights of contracting parties. Furthermore, it is essential to improve legal awareness and

provide suitable training to prevent complications associated with managing electronic contracts. The successful implementation of digital documentation technologies, including electronic signatures and encryption, significantly bolsters the credibility of contracts and protects them from tampering. In summary, it is evident that fostering collaboration among lawmakers, technology experts, and the community is vital for achieving security and trust in the digital business environment, thereby promoting greater effectiveness and transparency in all electronic transactions.

4.1 Results

The study reached the following results:

1. For electronic contracts to be valid and effective, they must include a specific set of essential elements.
2. Legal issues concerning cybersecurity, electronic signatures, and the safeguarding of personal information in online contracts are present.
3. The existing legal structures governing electronic contracts in Jordan, the UAE, and other nations often struggle to keep pace with swift technological advancements, necessitating ongoing legal updates to maintain alignment with these changes.
4. Disputes involving electronic contracts often entail complicated and protracted legal processes, which can hinder the enforcement of rights and diminish their protection.
5. A notable disparity exists in legal knowledge about managing and safeguarding electronic contracts between businesses and individuals, highlighting the need for legal training.

4.2 Recommendations

1. Updating the regulations on electronic contracts to take into account new technologies and emerging challenges.
2. Improving security measures in electronic transactions to ensure data protection and secure electronic signatures.
3. Standardizing international standards and regulations on electronic contracts to facilitate e-commerce and reduce legal complexity.
4. Simplifying legal procedures related to e-contract disputes to facilitate access to effective and timely solutions.

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Sustainable Educational Planning: Integrating Technology into Educational Development Strategies



Safeyah Tawil and Alalddin Al-Tarawneh

Abstract This research seeks to emphasize the crucial role of educational planning in fostering sustainable development, particularly highlighting initiatives undertaken in Saudi Arabia. Utilizing a descriptive-analytical methodology, the study observes and evaluates the educational policies that have been implemented and their contributions toward achieving sustainable development objectives. It explores the notion of educational planning and its importance in enhancing educational quality, while also reviewing the legal frameworks and strategies established in Saudi Arabia aimed at attaining comprehensive and sustainable development. Additionally, the research investigates the obstacles encountered in these endeavors, including issues such as limited resources and the necessity for advancements in educational infrastructure. The findings indicate that considerable strides are being made to bolster the contribution of education to sustainable development. Nonetheless, there is a pressing need to enhance collaboration among pertinent entities and to allocate additional resources and technical assistance to realize the intended goals. The study advocates for improved cooperation between governmental bodies and educational institutions to synchronize efforts and execute effective strategies, alongside the provision of essential financial and technical support to educational establishments, especially in remote regions, to upgrade infrastructure and elevate educational quality. Furthermore, it underscores the significance of promoting the integration of modern technology in education to more effectively achieve sustainable development objectives, as well as encouraging ongoing training programs for educational professionals to

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better equip them in addressing the increasing challenges within the educational landscape.

Keywords Educational planning · Sustainable development · Technology in education · Educational strategies · Digital education · Educational innovation · Sustainable education

1 Introduction

Given the significant transformations and advancements currently taking place globally, educational planning has emerged as a crucial instrument for fostering sustainable development and encouraging social and economic advancement. Development revolves around processes designed to elevate the quality of life and create opportunities for both individual and community advancement by augmenting human capabilities and accessible resources. Recognized as a fundamental aspect of this endeavor, educational planning plays a vital role in enhancing the educational system and ensuring its responsiveness to the changing demands of society [1].

Countries all over the globe are working on some composite development by implementing such educational strategies that would not only bring about economic and social advancement but also enhance the competitiveness of their human resources. For this to be achieved, it is necessary to have a clearly formulated vision and strategic objectives that would correspond to the challenges both local and global. Educational and development policies should be coordinated to ensure the implementation of the set goals [2].

In Saudi Arabia, a substantial transformation is being undergone by the education sector with the objectives of Vision 2030 which aspires to enhance the quality of education and inculcate those human skills that would meet current market needs. This sort of educational planning is not typical, but rather it is well above that as it integrates numerous programs and projects seeking to improve economic and social results while contributing actively to growth. The importance of this planning can be seen in its effective allocation of resources and formulation of educative policies that would create an informed society ready for any future challenges [3].

This research paper sets out to further analyze the concept of development and educational planning with a specific aim to clarify these concepts and their dimensions on both micro-and macro-levels using Saudi Arabia as a case study. It emphasizes the role of educational planning in improving the efficacy of development initiatives and its contribution to realizing sustainable development goals. The paper is structured into two primary sections: the first focuses on the definitions of development and educational planning, while the second examines educational planning and development in a global context as well as within Saudi Arabia.

1.1 Study Objectives

This study aims to achieve the following objectives:

- To analyze the relationship between development and educational planning at the global and local levels, with special reference to Saudi Arabia.
- To analyze educational planning policies and objectives in different countries such as Australia and Algeria, and draw conclusions that can benefit Saudi Arabia.
- To provide a critical study of educational planning policies in Saudi Arabia in the light of Vision 2030 and assess their effectiveness in achieving sustainable development.

1.2 Study Methodology

This research employs a descriptive methodology focused on systematically and accurately detailing and examining phenomena to achieve a thorough understanding. This approach is appropriate for exploring the connection between educational planning and sustainable development, as it facilitates the observation of the current landscape of educational planning alongside the analysis of existing policies and programs.

2 The Concept of Development and Educational Planning

The fields of educational planning and development play a crucial role in strategies for community development, as they seek to fulfill educational, social, and economic goals that improve the welfare of individuals and communities. This section will provide a comprehensive examination of the concepts of development and educational planning.

2.1 The Concept of Development

Development encompasses a holistic process focused on elevating the quality of human life through the advancement of economic, social, and cultural circumstances. It transcends the simple rise in gross domestic product (GDP) or economic expansion; rather, it includes the enhancement of human potential, as well as the betterment of health, education, and social equity. Sustainable development also entails the conservation of natural resources and their utilization in manners that serve the interests of both present and future generations [4].

Development can be characterized as a comprehensive process focused on attaining sustainable advancements in living standards by improving economic and social conditions, empowering human capabilities, and striving for social justice (UNDP 2021). From an operational standpoint, development refers to efforts aimed at enhancing individuals' overall quality of life by tackling economic, social, and environmental factors. The researchers assert that development extends beyond merely accumulating financial wealth; it also encompasses the enhancement of human capabilities like education and health, the realization of social justice, and the safeguarding of the environment to secure advantages for future generations.

2.2 The Key Aspects of Development

Development encompasses a complex array of dimensions, involving the interplay of various fields. It can primarily be categorized into three essential dimensions: economic, social, and environmental. The following provides an overview of these critical dimensions and the ways in which they interrelate and influence one another [5].

First: The Economic Dimension

The focus of development's economic aspect lies in utilizing resources optimally to guarantee maximum advantages while preserving the diversity of natural resources and their capacity for future regeneration. This dimension involves enhancing the efficiency of energy and resource consumption in developed nations, whereas developing countries aim to elevate living standards and fight poverty through the effective use of resources. During the 1990s, the concept of development expanded to incorporate the environmental dimension, which includes sustainable economic development that prevents the excessive exploitation of natural resources such as water, oil, and forests, and seeks to lessen adverse effects on future generations [6].

Second: The Social Dimension

The social dimension centers on individuals and their interdependent connection with society. It pertains to enhancing living conditions via education, health, equality, and ensuring opportunities for freedom and political involvement. This aspect highlights the importance of appropriate employment, public services, and development, while also addressing concerns such as health, education, social justice, poverty, hunger, housing, and social security [7].

Third: The Environmental Dimension

The sustainable utilization of renewable natural resources is highlighted by the environmental dimension of development, which aims to safeguard the environment's ability to regenerate and protect it for generations to come. Since its 1866 inception by German scientist Ernst Haeckel, the definition of environment has been in flux; Haeckel established ecology as a discipline to examine living organisms and their

interactions with surroundings. In the 1972 Stockholm Conference, the environment was divided into natural, biological, and social elements. Emphasis was laid on the preservation of ecosystems, avoidance of damage, and incorporation of these factors into all developmental activities [8].

2.3 The Concept of Educational Planning

According to [9], educational planning is an approach where systematization concentrates the organization of educational resources and the coordination of decisions and actions to be taken for specific pre-specified educational objectives. The process is considered a scientific activity that requires, as a result of its administrative character, being committed to running education matters along a certain holistic viewpoint predetermined line about what this involves. It encompasses the establishment of educational goals and the selection of various strategies to attain them, including the identification of the most effective options and the alignment of objectives with the resources available to maintain coherence throughout all components of the educational process.

Additionally, [10] characterized educational planning as the formulation of educational programs and the oversight of their execution to ensure that established goals are met. This process encompasses defining objectives and aims, devising necessary strategies, allocating essential resources, and preparing procedural plans that outline when, where, and how these strategies will be put into action. In essence, educational planning is the method by which we identify our desired outcomes in the educational sector, determine the means to achieve these objectives, and specify the resources and actions required for success [11]. This ultimately aids in enhancing the quality of education and improving the effectiveness of educational systems [12].

The researchers are of the opinion that planning in education is a crucial factor in enhancing the effectiveness of educational systems and meeting educational goals. It is, therefore, a systematic way of coordinating educational resources and focusing decisions and actions on achieving outstanding educational results [13].

The importance of educational planning stems from its critical role in the achievement of educational goals and designing effective programs for these objectives [14]. It also helps in adapting to rapid changes taking place in society and the labor market to ensure that students are provided with knowledge and qualifications [15]. In addition, educational planning provides a basis for improving the quality of education through curriculum development and teacher training [11, 16]

The goals of educational planning cut across a number of key aspects including the awareness on planning and culture raising among officials plus the staff equipped with skills to use planning tools and use them effectively [17]. Additionally, it aims to maximize the use of both human and material resources to facilitate the execution of educational plans and to enhance the educational environment [18]. Improving education quality is also a focus, achieved through curriculum development and the provision of modern educational tools [19]. Furthermore, educational planning seeks

to develop skilled human resources, boost educational productivity in accordance with developmental requirements, and reinforce the alignment between educational objectives [12, 20].

The researchers are of the opinion that these goals play a significant role in advancing educational systems by fostering a connection between educational and developmental needs, optimizing resource utilization, and elevating the quality of education [21]. Additionally, they aid in increasing educational standards and strengthening the contribution of human resources to the overall development process [22].

To sum up, the researchers assert that planning plays a crucial role in the development process, as it helps establish a robust educational foundation that fosters both economic and social growth. By emphasizing education and training, there is an enhancement of skills and knowledge, which aids in reaching developmental objectives [23]. The process of educational planning enhances individuals' capabilities and equips them with the essential skills needed to navigate contemporary challenges [24, 25]. In exploring the relationship between development and educational planning, the researchers identify a significant connection between education and its various aspects, viewing education as a genuine investment in cultivating individuals who can drive development. The goal of educational planning is to create a synergy between education and social and economic advancement, crafting educational strategies that correspond to societal and economic demands [13].

3 Educational Planning and Development in the World and in Saudi Arabia

3.1 Educational Planning and Development in Australia

According to the Human Development Index, Australia ranks fifth in the world as one of the foremost nations in education [15]. The country places a strong emphasis on education, regarding it as a collective societal concern that necessitates the involvement of all citizens in its reform and growth [16]. Integral to Australia's national strategies for enhancing educational quality and fostering human development are educational planning and development [17]. Through its policies, Australia strives to deliver high-quality education that aligns with the most recent global advancements in education [14, 18].

A study conducted by Al-Manea [15] underscored the notable hyperactivity within the realm of educational policy development, where reforms span multiple tiers, such as early education, higher education, assessment and accountability, curricula, and teaching methods. Additionally, Australian educational policies incorporate a variety of initiatives that mirror a wide array of global reforms [19]. These initiatives range from efforts to enhance quality and governance to linking education with both the

labor market and the social sector, as well as tackling the assessment of student performance.

Delving into educational planning, several key aspects stand out [16]:

- **Curriculum Development**: Australia is dedicated to enhancing and refreshing its curricula to align with the requirements of students and the labor market. These curricula aim to equip students with vital skills and the knowledge needed to tackle future challenges.
- **Teacher Development**: Australia aims to improve teacher competencies via ongoing training initiatives. These initiatives focus on implementing contemporary teaching methods to boost student learning results and elevate their skill sets.
- **Support Programs for Vulnerable Students**: Australia provides unique initiatives designed to assist students facing disadvantages or those with special requirements. The goal of these initiatives is to enhance the educational experiences of students hailing from vulnerable social and economic circumstances.

Considering the points mentioned earlier, the researchers posit that the Australian educational system stands out as an exemplary model within the education sector, largely due to its commitment to continually updating and enhancing its educational strategies in accordance with the latest global trends. The high quality of this system is underscored by Australia's fifth-place ranking on the Human Development Index, which highlights the substantial societal emphasis on education as a crucial area that necessitates the involvement of all stakeholders for its improvement and advancement.

3.2 Educational Planning and Development in Algeria

The educational system in Algeria has experienced various phases and obstacles, resulting in its increased engagement with global educational frameworks. Due to the historical ties between Algeria and France, the Algerian school system has encountered efforts aimed at Westernization and establishing connections with the Western world. Given the present situation, it is essential for Algeria to implement educational reform strategies that resonate with its realities, emphasizing national identity components such as Islam, the Arabic language, and the Amazigh language as the cornerstone of any reform initiative. To enhance the quality of education, Algeria is pursuing multiple measures [17, 24]:

- Using modern technology in education [25, 26].
- Developing scientific plans to train educational professionals [27, 28].
- Continuously updating information and teaching methods for educators [29, 30].
- Addressing the social needs of both teachers and students [31, 32].
- Providing health and psychological support for students [33, 34].

The quality of education is brought out by these initiatives, with an underscore of the importance of educational planning as a vital tool in achieving these goals. In giving structured directions, educational planning helps to match the education system with effective strategies that are a reflection of the realities and needs of society. Therefore, the success of any reforms or improvements in education is very dependent on the quality of educational planning and its coordination with national objectives and existing circumstances [18].

In Algeria, both the components of planning and development of education work in a coordinated way to contribute positively towards elevating the educational system resulting in progress. Educational planning is a vital tool that ensures optimal allocation of resources towards well-defined objectives responsive to the needs of society and the economy.

In the field of educational planning, it is the most important element of development. It aims to build capable generations able to build the future of this nation which will empower Algeria to meet the challenges of modernity. The development of the educational planning process in Algeria passes through different stages of development depending on historical, social, and political contexts of this country. After independence, efforts were focused on establishing an education system that reflects national, Islamic, Arabic, and Amazigh identities and at the same time being responsive to forces of globalization [19].

In Algeria, the goals of educational planning have focused on preparing a generation capable of meeting future challenges and actively participating in the development of Algerian society. In pursuance of this vision, policy measures have been undertaken to modernize curricula with reforms that create an enriched learning environment and introduce information worthy of today's technology age. There has also been a strong emphasis placed on continuous training and retraining for those in the teaching profession to ensure quality education and bring dynamism into the system [20].

Development is important in national strategies, and educational planning is at the base of all efforts of any country seeking progress. Education is vital for integral and sustainable development as schools help produce human resources who are qualified to support economic growth and social progress [21].

It is important to highlight that in Algeria, educational planning aims to make the most of human resources, especially in light of the country's constrained economic and social conditions. This planning plays a crucial role in aligning educational outcomes with the needs of the labor market. Additionally, it fosters social cohesion by ensuring equal access to educational opportunities for everyone, thereby promoting sustainable development [22].

Despite efforts to support educational planning and development, Algeria faces several challenges in this field, including [23]:

- Disparities in the quality of education between urban and rural areas.
- A lack of educational resources in some regions.
- The need to keep pace with global technological and educational advancements.

Nonetheless, Algeria remains steadfast in its quest for development and progress. The nation persists in its efforts to enhance educational planning through extensive reforms designed to modernize the educational framework. Additionally, Algeria has embraced various educational policies grounded in scientific research and strategic planning, which may aid in realizing comprehensive and sustainable development within the country [24].

From the viewpoint of the researchers, it is evident that Algeria is undertaking substantial initiatives to enhance its educational system via various reforms and updates. The researchers posit that educational planning serves as a crucial instrument, enabling Algeria to efficiently allocate its educational resources in pursuit of national objectives. Additionally, it bolsters the educational reforms that play a vital role in shaping a hopeful future for Algeria.

3.3 Educational Planning and Development in Saudi Arabia

Khuwaji in [25] delved deeply into the policies of educational planning in Saudi Arabia, highlighting several foundational elements of the educational planning system:

- **The Basic Law of Governance**: It serves as the constitution or fundamental law that defines the legal and political framework of the Kingdom. It includes general principles governing the system of governance and the relations between state institutions. In the educational context, this law emphasizes the importance of education as a fundamental right and mandates that it be accessible to all, in accordance with Islamic principles.
- **Saudi Arabia's Basic Education Document**: This document defines the main goals and principles of education in the Kingdom. It aims to promote Islamic and national values, develop the skills and knowledge necessary to keep up with global events, and prepare generations capable of contributing to sustainable social development.
- **Saudi Vision 2030**: This is the Kingdom's long-term vision, which includes comprehensive plans for the development of various sectors, including education. The vision aims to improve the quality of education, increase the effectiveness of teachers, and adapt curricula to the needs of the labor market. It also aims to improve e-learning and integrate educational technologies as part of efforts to achieve sustainable economic and social development.

According to [16], educational planning in Saudi is not only an essential organizational process but a key ingredient to achieving sustainable development. By improving the quality of education, it raises living standards which increases productivity that fosters economic growth; all of these aims are tied in with the Kingdom's ambitious Vision 2030. The research also revealed that educational planning helps identify both material and human resources available within a society that contribute to the planning of its economic and social landscape. Besides, it is through this process

that objectives are very heavily formulated and then brought to fruition by selecting targets that fit with the needs for advancement in different aspects depending on what is being taken into consideration from various angles—including those which have been predetermined politically test or where interest groups are involved.

Deeb and Bahamdan in [17] noted that several mechanisms could enhance the educational planning process directed toward achieving sustainable development. One of these mechanisms includes having goals and procedures in the planning that is general, maintaining a vision with ill-defined outcomes. Emphasis should be placed on enabling students to develop life skills in conjunction with scientific knowledge through targeted training programs. To keep pace with advancements in knowledge, curriculum content must be regularly updated in accordance with the latest scientific developments. Furthermore, the integration of modern scientific methods into education is essential, particularly through the effective use of technology within the educational framework. Finally, leaders of educational institutions should be chosen based on their capability to manage change and tackle challenges, ensuring they are adequately prepared before assuming their responsibilities.

In the field of development, the Saudi Ministry of Education has made significant efforts to link its goals with development through the following [18]:

- Providing inclusive, high-quality education for all members of society, contributing to building human capital that supports development.
- Offering continuous learning opportunities for all segments of society and encouraging them to benefit from these opportunities.
- Ensuring gender equality in educational and teaching opportunities.
- Supporting education as a driver of sustainable and inclusive economic growth.
- Establishing a robust and integrated infrastructure for the education sector.
- Elevating the intellectual and scientific levels of society.
- Participating in preserving natural resources to ensure that future generations can benefit from them.

Saudi Arabia aims to achieve comprehensive development by implementing multiple strategic plans that focus on enhancing and developing the educational infrastructure. Among the most prominent efforts are the development plans, which include [19]:

- **Ninth Development Plan (2010–2014)**: This plan focused on improving the educational environment to meet future needs by developing modern curricula that support the development of human resources and provide extracurricular activities to build well-rounded personalities of students. Its goals included increasing the internal and external efficiency of the education system, developing early childhood care, decentralizing administrative systems, improving education for gifted and special needs students, and supporting community participation in education.
- **Tenth Development Plan (2015–2019)**: This plan aimed to transition to a knowledge-based economy by promoting and investing in knowledge, raising national economic productivity by improving the efficiency of education and training, and addressing human resource development. It aimed to expand the

options for acquiring knowledge and skills, create a more attractive educational environment, and improve STEM (science, technology, engineering, and mathematics) curricula. In higher education, the plan focused on aligning educational outcomes with labor market requirements, expanding scholarship programs, granting autonomy to universities, and expanding postgraduate programs.

It is significant to note that the last officially declared development plan was the Tenth Development Plan (2015–2019). Several key factors contribute to this transition. After the completion of the plan, the Kingdom notably redirected its attention toward Saudi Vision 2030, a comprehensive strategic initiative designed to diversify the national economy away from reliance on oil and to foster growth in various sectors, including tourism, entertainment, and technology. Vision 2030 embodies a more extensive and holistic strategy compared to earlier development plans, aiming for fundamental transformations in both the economy and society. It may also encompass more integrated and comprehensive strategic projects and plans, effectively incorporating traditional development plans into broader, multifaceted frameworks. Additionally, development plans can be altered or adjusted in response to economic and political shifts, emphasizing the execution of significant projects and specific initiatives within the Vision 2030 framework. The researchers posit that the lack of a new development plan does not signify a cessation of development activities but instead indicates a concentration on new strategies and expansive initiatives that aspire to achieve sustainable development goals in a more cohesive manner [12].

Researchers' perspective deems educational planning in Saudi Arabia vital to the development and later sustenance of social and economic progress. The system of educational planning in Saudi Arabia is distinguished for its correlation with the country's national legal and political framework, including the Basic Law of Governance and Basic Education Document, while also fitting into Vision 2030 which concentrates on improving quality educationally, increasing teacher efficacy, and refining curricula. As further expounded in this work, educational planning acts as a critical tool in directing various education programs towards attaining comprehensive growth. Consequently, it is vital to incorporate educational strategies into national development plans to secure beneficial results for Saudi society and ensure its growth and progress.

4 Conclusion

To summarize, educational planning plays a crucial role in fostering sustainable development and facilitating social and economic advancement in various countries. This paper has illustrated that educational planning transcends a mere organizational function; it is an all-encompassing strategy that integrates economic, social, and environmental aspects to enhance quality of life and develop human potential. It is clear that developed countries like Australia have effectively leveraged educational planning as a mechanism for sustainable growth by modernizing curricula, enhancing

teacher competencies, and supporting at-risk student populations. Conversely, developing nations, such as Algeria, are working diligently to meet educational objectives through the integration of modern technologies, training educators, and addressing the social and psychological needs of students while also preserving national identity. In Saudi Arabia, Vision 2030 has acted as a significant driver for the transformation and advancement of the educational system to better meet market demands and contemporary requirements. Educational planning has evolved beyond conventional models to incorporate programs and initiatives designed to enhance educational results, establishing education as a vital instrument for achieving developmental aspirations. The significance of educational planning is apparent in its ability to direct resources and influence educational policies, thus aiding in the formation of an informed society equipped to tackle future challenges.

4.1 Findings

- The research indicated that effective educational planning is crucial for elevating the quality of education and ensuring it meets the needs of society and the labor market, ultimately contributing to social and economic progress.
- An analysis of global practices revealed a notable gap in the success of educational planning among different countries, where nations such as Australia implement sophisticated strategies, whereas others, including Algeria, encounter significant obstacles.
- The research highlighted the beneficial impact of educational policies in Saudi Arabia, especially those associated with Vision 2030, on the advancement of the educational system. Nonetheless, there is still a necessity for enhancements in aspects like curriculum development and teacher training.
- The findings highlighted that ongoing professional development for educators is crucial for enhancing the quality of education, and that investing in teacher training significantly improves the effectiveness of educational strategies.

4.2 Recommendations

- Connect educational planning strategies with sustainable development objectives to guarantee that education meets economic and social requirements, thereby strengthening its contribution to realizing Vision 2030.
- Updating and reviewing curricula is essential to address modern challenges and the changing job market, emphasizing the cultivation of students' life skills and innovative abilities.
- It is essential to prioritize ongoing training initiatives for educators to boost their effectiveness and strengthen their capacity to lead students in developing critical and creative thinking skills, ultimately enhancing the quality of education.

- Saudi Arabia ought to learn from the successful practices of nations such as Australia by implementing creative approaches in educational planning and utilizing technology to enhance the education system.

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An Efficient Method for Biometric Based Music Experiences Using Machine Learning



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Abstract Biometric technology has become increasingly popular in recent years, with its roots in various fields like security, healthcare, and personal identification. One exciting area of exploration is the integration of biometric data into music experiences. This intersection holds promise for enhancing how we engage with music, making it more personalized and emotionally resonant. Biometric-based music experiences rely on gathering data from individuals' physiological responses, such as heart rate variability, electrodermal activity, and facial expressions. This data is then used to dynamically adjust and shape the music in real-time. This approach opens up new possibilities for creating immersive and tailored musical experiences that cater to each listener's unique characteristics and preferences. Through the use of biometric data, music creators and technologists can create compositions that respond in real-time to listeners' physiological states, mood changes, and cognitive responses. This means that the music can adapt organically to how the listener is feeling, creating a deeper emotional connection. Furthermore, biometric-based music experiences have the potential to be used therapeutically. For example, music could be utilized as a tool for stress reduction, emotional regulation, and enhancing overall well-being. Overall, the integration of biometric data into music experiences has the potential to revolutionize how we interact with music, offering new avenues for personalization and emotional engagement.

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1 Introduction

Biometric Based Music Experiences offer a cutting-edge approach to music listening by integrating biometric data, including heart rate variability, electrodermal activity, and facial expressions, to enhance engagement and personalization [1]. It represents an innovative fusion of biometric technology and music listening, promising heightened engagement and personalized interactions [2]. However, challenges such as ensuring data accuracy, addressing privacy concerns, managing technical complexity, and ensuring user acceptance need to be navigated [3, 4]. Navigating challenges such as data accuracy, privacy, technical complexity, and user acceptance is essential for their success [5, 6]. Each session of these experiences involves capturing biometric data, processing it in real-time to adapt music content, providing feedback mechanisms, and offering personalized options, potentially incorporating therapeutic applications [7–10]. Despite these challenges, Biometric Based Music Experiences hold promise for revolutionizing how individuals interact with music, fostering deeper emotional connections and personalized engagement. Biometric Based Music Experiences hold immense potential to transform traditional music listening into immersive, emotionally resonant encounters tailored to individual preferences and physiological responses [11].

The following objectives carried out in this research include:

i. Data Acquisition and Processing: Develop a system to accurately capture and process biometric data, such as heart rate variability and facial expressions, during music listening sessions with the selection or development of appropriate sensors and devices capable of capturing relevant biometric signals with high fidelity.
ii. Algorithm Development: Design algorithms capable of analyzing biometric data to understand listeners' physiological and emotional states, enabling dynamic adaptation of music content. Algorithms may include classification models, pattern recognition algorithms to integrate multiple biometric modalities.
iii. Personalization and Customization: Create mechanisms to personalize music experiences based on individual listeners' biometric profiles and preferences, enhancing engagement and emotional resonance. This module involves the development of user modelling techniques to capture individual preferences, behavior patterns, and emotional responses.
iv. Real-Time Adaptation: Implement algorithms that allow for the real-time adaptation of music based on changes in listeners' physiological responses, ensuring seamless and immersive experiences. This module focuses on the integration of real-time processing and feedback mechanisms to dynamically adjust music

content based on evolving biometric signals [12]. Techniques may include adaptive filtering, dynamic time warping, and reinforcement learning algorithms to optimize music content in response to listeners' physiological and emotional states.

2 Literature Review

Schedl [1] Study emphasizes the potential of deep neural networks in addressing limitations of traditional music recommendation systems. Despite advancements, challenges like lack of transparency in decision-making and the absence of established multimodal datasets persist, underscoring the need for comprehensive research and evaluation metrics in this domain.

Zhang et al. [2] Propose a novel method for recognizing personal music emotional experiences by integrating human physiological characteristics and music features, employing machine learning algorithms for personalized music recommendation. While the study demonstrates promising results, potential limitations such as a limited sample size, lack of diversity, and overfitting issues in machine learning algorithms could impact its generalizability.

Investigates [3] the impact of visual memory and musical sophistication on control-oriented user interfaces for music recommender systems, highlighting the significance of tailored visualizations and user controls for enhancing recommendation acceptance and diversity. However, the research's focus on only two personal characteristics may limit its scope, potentially overlooking the broader complexity of user preferences in diverse musical contexts.

Investigate [4] the impact of users' personality traits, assessed through the OCEAN model, on the accuracy of music recommendation algorithms, aiming to uncover potential biases across different personality groups. While utilizing a dataset of Twitter users' music consumption, the research's focus on this specific platform may constrain its ability to capture the comprehensive factors influencing algorithm performance and diverse user preferences.

Develops a music [5] recommendation system using both content and collaborative filtering methods, focusing on correlating user preferences with mood, genre, artist, and top charts to enhance personalized recommendations [13]. While utilizing a dataset of over ten thousand songs, the research's limitations include a restricted set of twenty artists and the absence of emotional detection through facial recognition, which may constrain the system's adaptability and precision in song recommendations [6].

Employs a deep learning [9] approach and IoT architecture to develop an intelligent music recommendation system, emphasizing optimized feature extraction algorithms for accurate indoor scenario recognition and music selection. Utilizing scale-invariant feature transformation, support vector machines, and Fast-RCNN, the research introduces a middle-level feature structure algorithm to enhance indoor scenario recognition and classification [14].

Investigate the customization [10] of personalized explanations in music recommender systems based on three personal characteristics: need for cognition, musical sophistication, and openness, aiming to improve user understanding and acceptance of recommendations [7]. While the research provides tailored explanations and design suggestions, its focus on only three personal characteristics may limit its scope, potentially overlooking other influential factors in diverse musical contexts [15].

Investigate the integration [3] of data science, biomedical imaging techniques, and theatrical and compositional ideas to create interactive music experiences through an experimental music installation [8, 9]. Utilizing gestural interfaces and sensory input devices, the study translates physiological behavior into live music remixes, involving biometric data from performers and a large audience [10–12]. While innovative, the research's unique live performance nature and potential biases in biometric data collection may limit its generalizability [13, 14].

Smayda et al. [5] Explore the emerging field of music-based therapeutic technologies for neurological and mood disorders, assessing their efficacy, user engagement, and integration into healthcare systems. While employing a comprehensive review and case vignettes, the chapter acknowledges limitations in the evidence base for some music-based therapeutic technologies and underscores challenges in clinical implementation and business models within the Music-Based Interventions (MBI) landscape.

[6] Introduces a convolutional neural network (CNN)-based deep learning system for personalized music recommendations, aiming to address the challenge of recommending music amidst the rapid growth of music content. While employing deep learning techniques and evaluating algorithmic performance against various methods, the paper's primary focus on algorithmic efficiency may limit its consideration of user preferences, context, and recommendation interpretability, potentially impacting real- world applicability and user satisfaction [15, 16].

Kostrzewa et al. [7] Develop a content-based music recommendation system utilizing genre classification, Mel- frequency cepstral coefficients (MFCCs), and song tempo analysis to address the challenge of automated music recommendation in large online databases. While employing an artificial neural network and audio feature extraction techniques, the research acknowledges limitations due to a small dataset size, potentially impacting the generalizability of findings, and identifies an outlier in country music genre recommendations that could skew results [17–19].

3 Proposed Methodology

Our work aims to develop a comprehensive system for Biometric Based Music Experiences (BBME) that integrates multiple biometric signals to dynamically adapt music content in real-time, enhancing engagement, personalization, and emotional resonance [20]. Our novelty lies in its holistic approach, addressing all aspects of BBME development outlined in the objective statements. We aim to not only develop

algorithms for analysing biometric data and adapting music content but also prioritize user personalization, real-time adaptation, and ethical considerations [21–25].

Additionally, our focus on therapeutic applications distinguishes our work, aiming to explore the potential of BBME beyond entertainment to promote mental well-being [26]. In Fig. 1, the proposed methodology for the biometric-based music recommendation system is structured into four key modules: Data Acquisition and Processing, Algorithm Development, Personalization and Customization, and Real-Time Adaptation [27].

In the Data Acquisition and Processing module, specialized sensors such as heart rate monitors and facial expression analysis tools are employed to capture relevant biometric signals from users [28]. The collected data undergoes pre- processing,

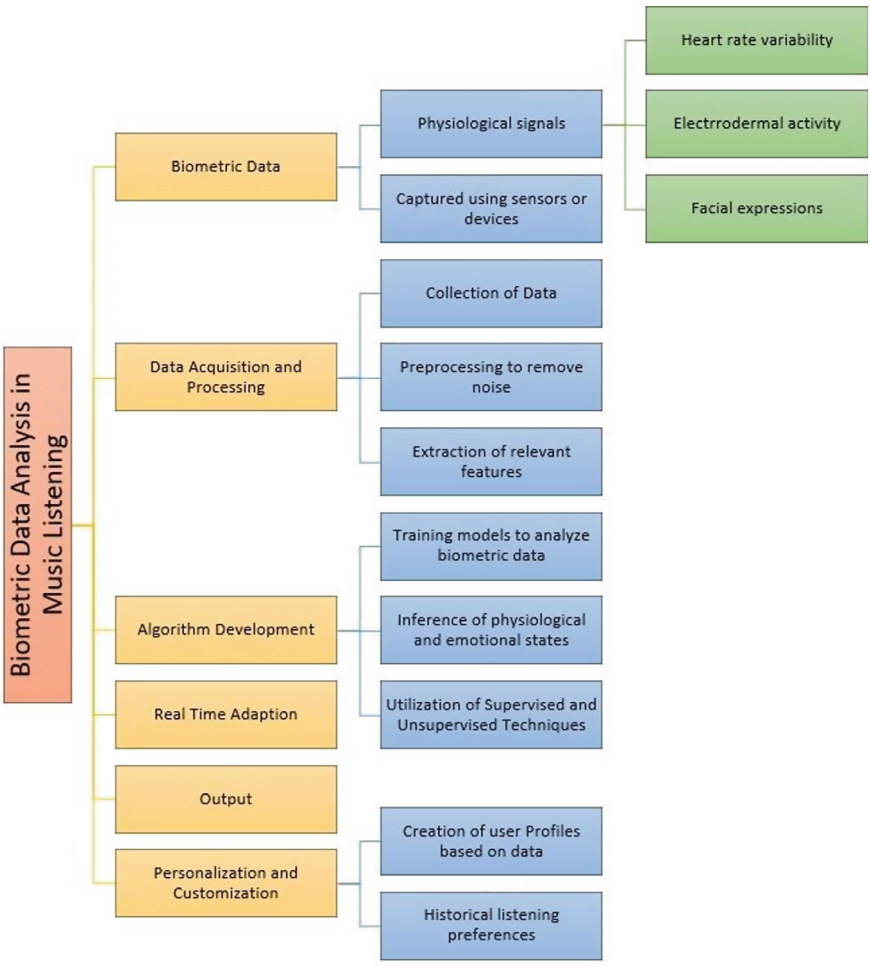


Fig. 1 Overall architecture diagram for the biometric based music experiences system

including filtering and noise reduction techniques, followed by feature extraction to facilitate subsequent analysis and model training.

The Algorithm Development module utilizes machine learning algorithms to train predictive models using the processed biometric data. These models aim to analyse and infer listeners' physiological and emotional states, subsequently predicting user preferences and mood based on the inferred states to enable more personalized music recommendations [29].

In the Personalization and Customization module, detailed user profiles are developed by integrating biometric data, historical listening preferences, and user feedback. These profiles form a comprehensive understanding of individual user preferences and behaviours, which is then utilized by either collaborative filtering or content-based recommendation algorithms to deliver tailored music recommendations [30].

Finally, the Real-Time Adaptation module continuously monitors biometric signals in real-time during music playback sessions to capture dynamic changes in users' physiological and emotional states. Adaptive filtering techniques are then employed to dynamically adjust music parameters, such as tempo, genre, and intensity, based on these real-time changes, thereby optimizing the music listening experience and enhancing user engagement.

By integrating these modules into a cohesive framework, the proposed methodology aims to establish an advanced biometric-based music recommendation system that leverages machine learning algorithms, real-time adaptation, and personalized user profiling to deliver highly tailored and dynamically adjusted music recommendations based on users' physiological and emotional states, ultimately enhancing user satisfaction and engagement with the music listening experience.

In the proposed biometric-based music recommendation system, Python libraries like SciPy, NumPy, and Pandas are used for data manipulation and signal processing. Figure. 1 shows the overall Architecture Diagram for the Biometric Based Music Experiences System Machine learning models are tested and deployed using Python frameworks, while recommender system libraries like LightFM or Surprise are employed for personalized music playlist creation. Real-time data processing and analytics are facilitated by specialized Python frameworks. On the hardware side, biometric wearable sensors capture real-time physiological signals, supported by high-performance computers with cloud and GPU capabilities for data processing and machine learning model training. Dedicated servers are utilized for real-time music content adaptation. This integrated approach aims to deliver tailored and dynamically adjusted music recommendations based on users' physiological and emotional states, enhancing user satisfaction and engagement with the music listening experience.

4 Comparison with Existing Work

The existing initiatives, such as "EmotiMusic" by MIT Media Lab, "Mood Music" by University of Groningen, and Spotify's Mood Playlists, represent pioneering efforts in the integration of biometric data into music experiences. While these projects have made significant contributions by adapting music content based on specific biometric modalities such as heart rate or facial expressions, they often exhibit limitations in their scope and approach. These initiatives typically focus on single or limited biometric signals, thereby missing out on the potential benefits of a more holistic approach that integrates multiple physiological and emotional cues simultaneously. Additionally, there is a notable absence of comprehensive user-friendly interfaces and ethical frameworks, limiting the broader applicability and acceptance of biometric-based music experiences. Furthermore, the therapeutic potential of such systems is generally underexplored, with most projects concentrating primarily on entertainment and stress reduction.

In contrast, our proposed work aims to address these existing gaps and limitations by developing a comprehensive Biometric Based Music Experiences (BBME) system. Our approach is characterized by its holistic nature, as it integrates multiple biometric signals—including heart rate, facial expressions, and possibly others—to dynamically adapt music content in real- time. We place a strong emphasis on user personalization and real-time adaptation, ensuring that the music listening experience is tailored to individual preferences and emotional states. Additionally, we prioritize ethical considerations, aiming to establish a robust framework that safeguards user privacy and data security.

Moreover, what sets our work apart is our focus on therapeutic applications. While existing initiatives primarily focus on entertainment and stress reduction, our research aims to explore the broader therapeutic potential of BBME in promoting mental well-being and addressing various mental health challenges. By doing so, we aspire to redefine the scope and impact of biometric-based music experiences, positioning them not merely as entertainment tools but as powerful therapeutic interventions with significant implications for mental health care and well-being. In summary, our proposed work represents a novel, comprehensive, and ethically grounded approach to BBME, aiming to enhance user engagement, personalization, and emotional resonance while unlocking new avenues for therapeutic applications in mental health and well-being.

5 Experimental Results

In our research, we leverage the "data_moods.csv" dataset from Kaggle to develop our Biometric Based Music Experiences (BBME) system. Ensuring dataset integrity, we employ Python's NumPy and Pandas for comprehensive data cleaning and preprocessing, which includes removing duplicates and managing missing values. We

utilize scikit-learn, scipy, and sklearn libraries for machine learning model development, initially training with RandomForestClassifier and subsequently refining our model using GridSearchCV and Gradient Boosting Classifier to achieve optimized performance. With the above models, we can say that RandomForestClassifier yields the maximum accuracy of 81.16% based on the dataset used from Kaggle.

5.1 Algorithms

(i) Mood Prediction Using Random Forest Classifier

Input:

a. Features: [‘popularity’, ‘length’, ‘danceability’, ‘acousticness’, ‘energy’, ‘instrumentalness’, ‘liveness’, ‘valence’, ‘loudness’, ‘speechiness’, ‘tempo’, ‘key’, ‘time_signature’]
b. Target variable: ‘mood’
c. Data: ‘data’

Output:

a. Accuracy of the model
b. Predicted mood for a new sample

Algorithm Steps:

1. Split the data into features (X) and the target variable (y).
2. Using train_test_split(), split the dataset into training and testing sets.
3. Scale the features using StandardScaler().
4. Initialize a Random Forest classifier with specified parameters (e.g., n_ estimators).
5. Train the Random Forest classifier using the training data.
6. Predict the target variable for the test set.
7. Calculate the accuracy of the model using accuracy_score().
8. Print the accuracy of the model.
9. Provide an example prediction for a new sample:
   - Scale the new sample using the same scaler used for training.
   - Use the trained classifier to predict the mood for the new sample.
   - Print the predicted mood for the new sample.

End Algorithm.

5.2 Explanation

This algorithm predicts mood using a Random Forest Classifier. It starts by splitting data into features and target variables, then divides it into training and testing sets. Features are scaled for uniformity. A Random Forest classifier is trained on the scaled training data and used to predict mood for the testing set. The model's accuracy is calculated by comparing predicted values with actual mood. Finally, it provides an example prediction for a new sample by scaling input features and using the trained classifier.

(i) **Song Recommendation Input:**

a. song_name: A string representing the name of the song for which recommendations are sought.
b. data: The dataset containing information about songs, including features like 'popularity', 'length', 'danceability', etc., along with their names.

Output:

a. A list of recommended songs similar to the input song. The list contains up to five songs that are most similar to the input song and are also popular among users.
b. If the input song is not found in the dataset, a message is printed indicating that the song is either not popular or invalid, along with some random song suggestions from the dataset.

Algorithm Steps:

Algorithm recommend_songs (song_name, data):

1. Initialize an empty list to store recommended songs.
2. Check if the song_name exists in the data:

   If not, print a message indicating the song is either not popular or invalid.

– Print some random song suggestions from the data.
– Return.
– Compute the similarity factor between the song_name and each song in the data using get_similarities function.
– Add the computed similarity factors as a new column 'similarity_factor' to the data.
– Sort the data based on 'similarity_factor' and 'popularity' in descending order.
– Display the top 5 recommended songs (excluding the input song itself).

End Algorithm.

5.3 Explanation

This algorithm, ‘recommend_songs‘, takes a song name and a dataset as input. It checks if the song exists in the dataset, calculates its similarity with other songs, and sorts them based on similarity and popularity. It then returns the top 5 recommended songs excluding the input song. If the input song is not found, it prints a message and suggests random songs.

To gain deeper insights into the dataset’s structure and relationships, we employ seaborn and matplotlib for data visualization and analysis, creating detailed visual representations that highlight correlations (Fig. 4), trends, and potential outliers among various dataset attributes. Figure 2 represents the Feature Importance calculated by the SimpleImputer strategy with Instrumentalness topping the chart. Our custom recommendation algorithm is a pivotal component, as it computes song similarities based on user input and mood predictions. This algorithm sorts and presents the top 5 recommended songs from the dataset, enhancing the user experience by providing personalized music suggestions tailored to individual preferences and moods. Figure 3 highlights the pairplot of selected features with reference to the moods and Fig. 7 on the other hand depicts the density distribution of the top features identified by the algorithm.

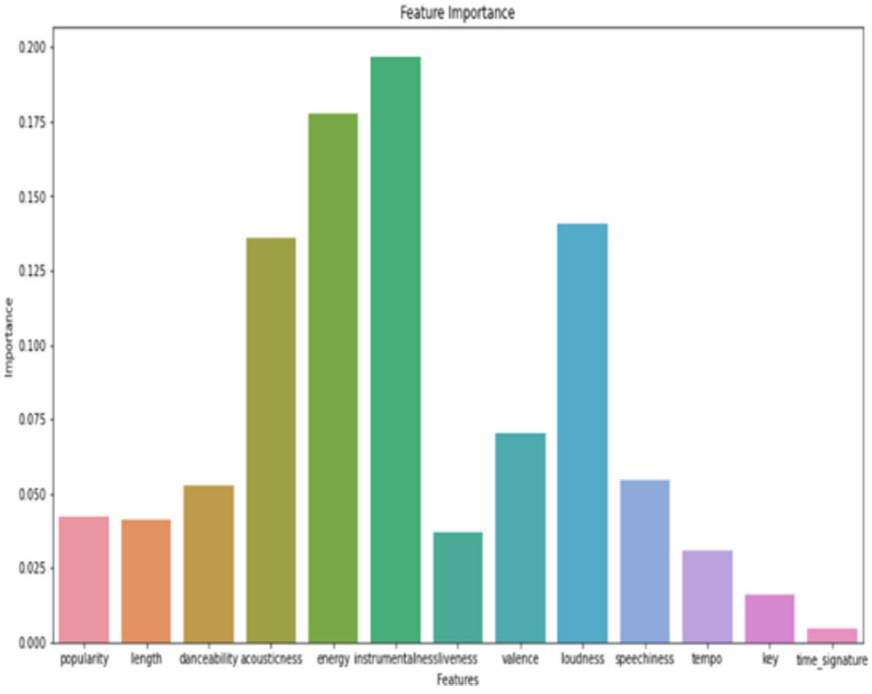


Fig. 2 Feature importance Barplot

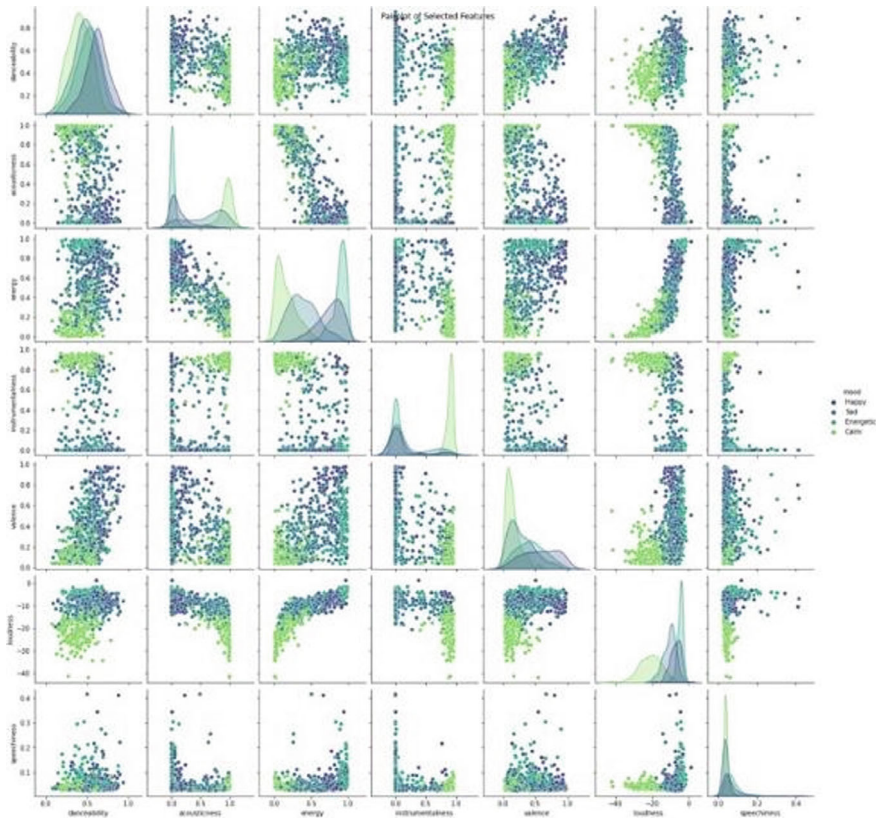


Fig. 3 Pairplot of selected features

Fig. 6 shows the boxplot for some top features identified by the strategy and plots them against the mood thus highlighting the potential outliers for the same. To represent the frequency of moods specified in the dataset, a bar plot has been used to depict the distribution of moods in Fig. 6.

Figure 7 shows Comparison of data collection and validation, we utilize smart watches equipped with a range of sensors, including heart rate monitors, brainwave detectors, emotional sensors, and movement trackers. These smart watches capture and record comprehensive biometric data, which is subsequently transformed into structured datasets for analytical purposes. This biometric data serves as a valuable resource, providing essential insights and validation metrics to refine and optimize our machine learning models, thereby enhancing their accuracy and predictive capabilities.

Overall, our BBME system effectively adapts music content to users' biometric signals, moods, and preferences, thereby significantly enhancing user engagement, fostering personalized experiences, and deepening emotional connections within the music listening journey.

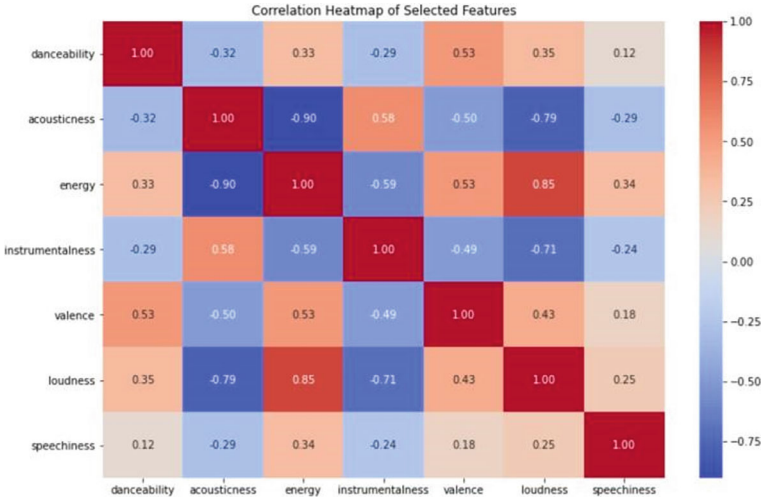


Fig. 4 Correlation Heatmap of selected features

6 Conclusion and Future Work

This chapter addresses key challenges in Biometric Based Music Experiences by implementing robust data acquisition methods for accurate biometric signal processing and incorporating privacy safeguards to ensure ethical data usage. We've developed a comprehensive system integrating data acquisition, algorithm development, personalization, and real-time adaptation modules. Achievements include achieving high prediction accuracy, upholding ethical standards, and enhancing user engagement through an intuitive interface.

For future enhancements, we plan to integrate additional biometric modalities, explore advanced machine learning algorithms, and extend the system's capabilities to therapeutic applications. Additionally, we aim to implement interactive feedback mechanisms and optimize scalability for seamless integration with existing platforms, enhancing the system's accessibility and user reach. Our work aims to revolutionize Biometric Based Music Experiences, offering personalized, engaging, and therapeutic music listening tailored to individual physiological and emotional profiles.

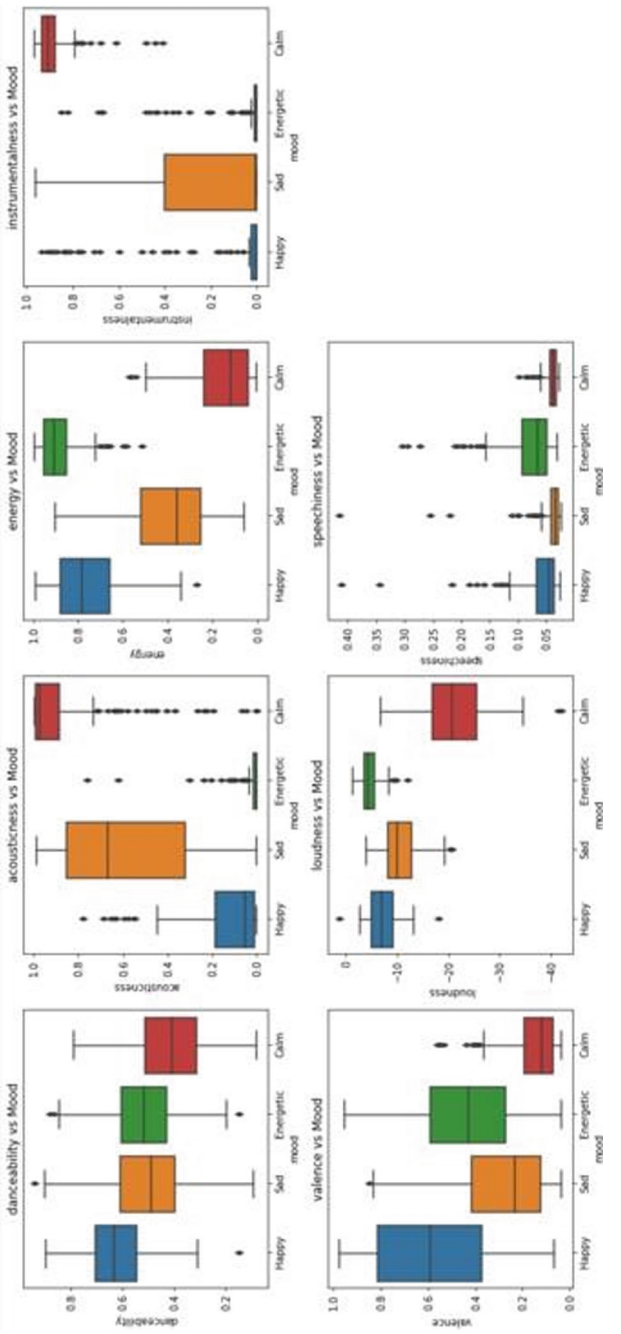


Fig. 5 boxplot

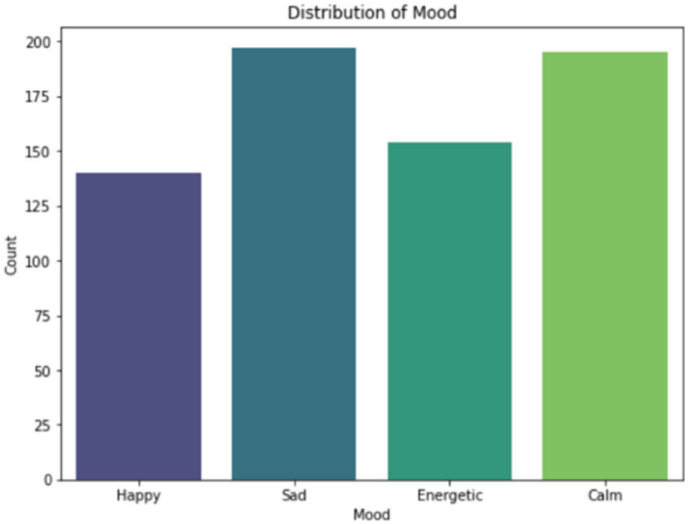


Fig. 6 Distribution of moods

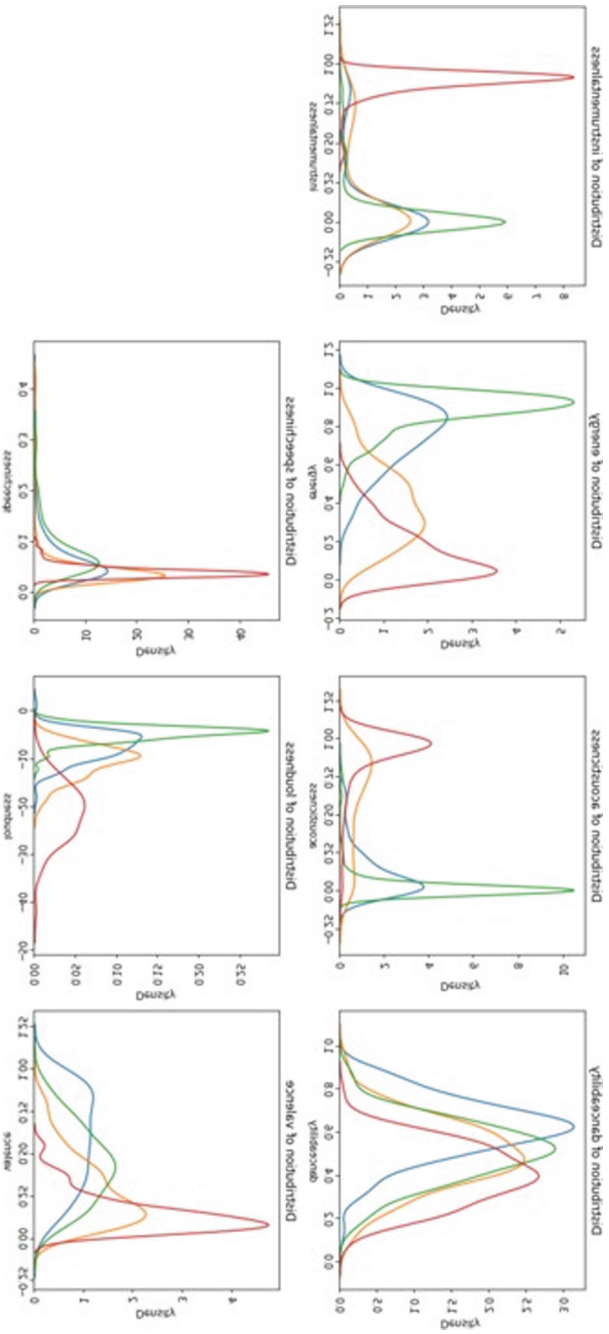


Fig. 7 Comparison of data collection and validation

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Blended Learning in Arabic Language Classrooms: Opportunities and Challenges



Mohammed Saleem Ismail Al-Mallahma

Abstract The present chapter can help one understand the prospects and challenges of applying blended learning in Arabic language classrooms. Applied as a model for teaching, blended learning combines traditional teaching methods with the use of online activities. While blended learning has attracted increasing attention in different educational fields, its practice in Arabic language education is not adequately established. Validation was realized through an analysis of literature and descriptive perspectives on AI-powered tools within blended learning environments. Blended learning was found to have considerable potential for enhancing language acquisition through flexible and personalized learning experiences. The main problem is that many of these initiatives demand the transformation of old methods into digital ones, which is too big a burden for weak countries that do not even have good roads to talk about robust technological infrastructure; but this study emphasizes strategic planning supported by continuous training needs further research so that gains realized from such models can be maximized in preparing learners for effective participation globally.

Keywords Blended learning · Arabic language education · AI-powered tools · Traditional instruction · Online learning · Language acquisition · Educational technology · Personalized learning

1 Introduction

The interest in exploring various potentials for integrating traditional classroom instruction with online learning has increased significantly in recent years in several academic fields. Blended learning is an educational paradigm resulting from the

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need to offer effective study programs that reflect the evolution of technology [1]. Several models of blended learning have already been developed and applied to teach languages, having gained considerable popularity worldwide among language instructors. However, very little research has attempted to investigate the effectiveness of blended learning models in Arabic language classrooms [1]. This gap calls for the present investigation whose main goal is to study the application of the blended learning model in teaching the Arabic Language with specific reference to answering its two research questions.

1.1 Research Questions

- The first of these research questions is "What are the components of a blended learning model that can be used in Arabic Language Classrooms?"
- The second research question is "From the perspectives of Arabic language instructors, what are the challenges and opportunities of implementing a blended learning model in Arabic Language Classrooms?"

1.2 Significance of the Study

The importance of the present study will be in trying to place its rather targeted groups of Arabic language instructors and learners who work or study in different Arabic language centers worldwide in hindsight. These individuals would hopefully stand to benefit from the opportunities, as envisaged through the use of innovative methods of teaching Arabic language, in blended learning classrooms. As for practical significance, because both traditional modes and online modes of teaching Arabic Language are two such arms that are being used in present times in any case in Arabic language teaching centers, a blended learning model introduces a hybrid alternative mode. This would try to take advantages from both so as to come up with some kind of an attempt that would be able to cater to the needs and preferences (formulated by themselves) of the instructors as well as those being taught [2].

1.3 Methodology

This study applies a qualitative approach to explore the integration of AI applications in teaching and assessment of the Arabic language within blended learning environments. It utilizes a descriptive approach in reviewing the literature on AI use in education with a focus on teaching the Arabic language. The paper will review theoretical frameworks, case studies, and empirical research specifically for opportunities and challenges of the blended learning model. It uses an analytical approach

to synthesize findings critically regarding how far AI-powered tools may or may not enhance teaching and assessment within blended Arabic language classrooms. The methodology will be highly beneficial in drawing some pragmatic insights for teachers and policymakers about how best AI applications can be used so that there are improved learning outcomes.

2 Overview

For thousands of years, learning has been an essential aspect of the human experience. As various cultures developed, the necessity to convey and exchange knowledge became crucial for preserving their values, norms, and ethos [3]. In the contemporary era of globalization, the world has transformed into what is often referred to as a 'global village,' leading to extensive cultural exchanges. This exchange of ideas and cultures has in addition created what can be referred to as cultural imperialism, influenced largely by the ideas of Western societies which include democracy and capitalism coupled with the use of English as a global lingua franca. For an Arab and Islamic culture that held sway for centuries, this transition was deeply troubling on both political and cultural counts. At the center of this cultural domination is control over higher education and distribution of information, important in remaining relevant in the changing global landscape. The development of the Internet as a vehicle for knowledge sharing has also accelerated further sidelining these Arab and Islamic cultures.

The challenge was warmly embraced, resulting in a national Arabic online encyclopedic initiative; it was designed to be a worldwide free resource of knowledge in Arabic. From its creation, the platform has seen significant evolution in both shape and content: it has changed from being just an encyclopedic initiative to providing educational resources, user support, and pushing universities to understand the need for a strong presence of the Arabic language on the Internet if they are to ensure relevance as well as ownership of the knowledge that is produced within the Arab world [3].

Simultaneously, just as the advent of the printing press transformed traditional oral learning methods, the Internet has also revolutionized learning paradigms, creating fresh opportunities in distance education and e-learning. These forms of education are viewed as a remedy for the challenges facing higher education in both developed and developing nations. With the advent of globalization, focus has shifted from individual nation-states to a global knowledge society. The networking of knowledge has emerged as a key characteristic of modernity and the process of modernization [4]. As this network of knowledge crosses international boundaries, it presents a challenge to the exclusive control over knowledge networking previously held by a select few states. The established role of higher education as a sovereign tool for states to support developing and post-colonial nations, alongside the dominance of Western states—especially the US—in this crucial area of knowledge production, is now being contested by the rise of new players and networks.

2.1 Theoretical Frameworks

The globalization of English education in the Arab world has altered the knowledge and skills required by Arab students who possess limited proficiency in the Arabic language. This gradual transition toward English instruction has raised alarms regarding the ongoing disregard for Arabic literacy, along with its significant historical, economic, social, and cultural heritage [5]. However, previous research on blended learning has generally yielded favorable educational results, with participants noting that blended settings contributed to overall learning enhancement—a goal that has long been pursued by educators, academic institutions, governmental bodies, and policymakers. This paper investigates the current and emerging opportunities and challenges that federally funded blended learning projects present for Arabic language educators, students, and administrators. As new initiatives involving internet-based tools and social networks are introduced, this literature review serves as a valuable resource for evaluating the present state of research in blended learning maker spaces and for suggesting potential pathways for future directions and expanded research efforts.

This paper will discuss the theoretical frameworks underpinning the design of BL teacher education programs in the Arabic language context [6]. The BLL context is a blend of both physical presence and technology-mediated collaboration among teachers as well as learners who are engaged in co-located Arabic activities using varied Arabic resources. It reflects a socio-culturally informed view on learning that stresses collaborative dialogue between teacher mentors and peers in classroom spaces. This theoretical perspective was originally nurtured in the field of second language acquisition but later extended to all types of educational environments for language development research. The BL design draws heavily on some core principles related to language, learning, teacher, and student in Arabic language classrooms; these, when combined, provide a much stronger framework for understanding BL within Arabic education [7].

3 Advantages of Blended Learning in Arabic Language Classrooms

Blended learning in Arabic language classrooms provides a wide range of opportunities for teachers and students and allows learners to have greater flexibility in dealing with learning content, tasks, and activities. Moreover, through the use of advanced digital activities it is possible to increase student engagement, collaboration, interactivity as well as content sharing. These advantages will be detailed further in the upcoming section related to how blended learning increases student engagements with more details on the same while also enhancing flexibility and accessibility.

Blended learning significantly enhances student engagement with course material, tasks, peers, and educators. According to the literature, students in traditional courses

that do not integrate blended learning often engage passively with information since such courses are heavily dependent on the conventional one-way transmission of teaching. The paper posits that students become passive recipients of information. In contrast, Blended Learning provides multiple opportunities for educators to curate and implement interactive activities across different platforms: peer-to-peer interaction can be facilitated by teachers using social networking sites like Facebook, WhatsApp, or Twitter where students are able to create, share and comment on content both during class hours and beyond regular school hours. This not only fosters engagement with the subject matter but also promotes collaboration among students in generating and interacting with the content. Teachers can also design activities for creating, editing and sharing content using platforms (other than LMSs) such as YouTube or Vimeo. It increases interactivity and hence the creation of several types of content—videos, infographics, 3D presentations. Evidence from recent studies shows a positive relationship between interactivity with satisfaction and perceived learning [7]. Also, involving oneself in high-level digital activities begets an increase in content creation: students produce and share more advanced kinds of content when levels of interactivity are high. This is how they come to develop those higher-order skills with nominal emphasis on memorization or the application of algorithms that typically marks a conventional non-blended course.

Blended learning helps in reducing the constraints of time and space, thus making the delivery of courses and student involvement more flexible and accessible. Various digital delivery ways allow students to choose how they will interact with course materials and activities. For example, online discussion forums enable students to respond to content and their peers' remarks at their convenience, rather than adhering to predetermined schedules typically associated with in-person classes. This adaptability proves particularly advantageous for those who have jobs or other obligations [8]. The ability to access online activities anytime and anywhere significantly boosts engagement opportunities, as students are not confined to specific times and locations. Furthermore, blended learning facilitates student interaction beyond the traditional classroom setting, allowing learners to utilize smartphones and mobile devices instead of being limited to desktop computers in labs and classrooms. It also improves accessibility for students with special needs; research suggests that technology-based teaching and assessment methods enhance engagement for students experiencing social anxiety or who have lower academic performance [8].

3.1 Enhanced Student Engagement

The revitalization of teaching and learning methods has been ignited by the integration of technology in education. With the rise and widespread use of multimedia technologies and the internet, educators now possess innovative tools that enhance their teaching practices. One area that leverages the advantages of technology to enrich the learning experience is educational development. This has led to the creation of the blended or hybrid learning format, which combines traditional

and online teaching methods. Online learning encompasses a variety of formats, ranging from entirely virtual classes to supplementary resources for conventional instruction [9]. The blended or hybrid learning model incorporates both traditional face-to-face teaching and online elements. The key distinction between hybrid and blended learning lies in the initial format of the course: hybrid originates from a traditional face-to-face format, while blended stems from an online format that is later supplemented with in-person instruction. It is important to consider that students may possess varying levels of digital literacy and access to internet-enabled devices for both models, necessitating course designs that accommodate these differences.

The environment in which L1 and L2 language classes operate varies significantly across numerous dimensions, including the goals of instruction, assessment methods, materials used, the "naturalness" and spontaneity of classes, and the frequency of feedback, among others [10]. These variations pose distinct challenges for designing courses. In language education, blended learning has the potential to broaden the conventional range of teaching activities—such as employing Wikis, Blogs, and Padlets for collaborative writing, which fosters creativity and peer-review—and can also enhance nearly every aspect of language acquisition, including planning, interaction during class, feedback mechanisms, activities outside of class, reflection, and the analysis of learning outcomes. Designing courses for blended language learning requires a thorough understanding of the specific opportunities and challenges that arise from utilizing multimodal texts and technology within the language classroom, such as the potential for misinterpretation of interactivity, the organization of tasks to maximize processing depth, and an implicit grasp of fostering learner autonomy [11].

Not every module and student group may find blended or fully online learning formats suitable, especially when there are disparities in access to online technologies. The design of blended learning courses should stem from a thorough evaluation of the availability and condition of devices such as headsets, laptops, or mobile phones, as well as considerations for reliable internet connectivity, prior experiences with technology in L2 learning, levels of computer literacy, English language proficiency, maturity, motivation, cultural variances, learning preferences, and a critical awareness of online resources, anonymity, and the reliability of digital communication [12]. It is essential to recognize that online tools evolve rapidly, with new, popular platforms emerging frequently. Both educators and learners may find it challenging to adapt to these changes, as becoming accustomed to them demands time, effort, flexibility, and a willingness to alter fundamental teaching and learning practices. Conversely, technology can also act as a significant instrument for monitoring and controlling specialized activities.

3.2 Flexibility and Accessibility

In Arabic language classrooms, blended learning offers both flexibility and accessibility within the teaching and learning process. This is supported by the views of

both teachers and students, as illustrated in Tables 3 and 4, which present the items related to this theme. Notably, items 6, 16, 9, and 24 pertain to the flexibility and accessibility experienced by teachers and students, respectively.

Determining an appropriate time for language instruction can pose a challenge for educators. Blended learning offers a viable solution to this issue. As noted in item 6, "I can teach Arabic whenever I want even when I am not on campus," instructors have the flexibility to teach Arabic beyond standard university hours. This creates the possibility of offering language lessons in the morning, evening, or on weekends without the necessity of being physically present on campus, a situation that many Arabic teachers find challenging [13].

In addition, blended learning offers teachers with various social obligations the opportunity to find time for teaching Arabic. For instance, one teacher noted, "I am a housewife; thus it is hard to teach Arabic in the traditional way." This suggests that blended learning can help mothers and other educators with differing commitments to earn a living by teaching Arabic. As mentioned in item 16, "The voice/video response feature in blended learning gives me a nice chance to reply to students when they ask a question," and "The audio/video features in blended learning encourage me to explain the difficult words or sentences in voice/video format." Therefore, blended learning provides teachers with the flexibility to choose how they communicate with their students, ultimately fostering an accessible environment for both educators and learners.

Teachers of the Arabic language assert that blended learning offers advantages such as accommodating a diverse range of student levels, varying classroom sizes, and different time durations. They say, "There are different levels of student understanding in learning Arabic," and express a willingness to admit the challenges that come with teaching Arabic in larger classrooms, but these difficulties can be managed through blended learning. For example, students can go through some of the materials online before attending their Arabic classes so that they will have been exposed to some concepts and come ready with questions on areas they did not understand well [13]. Also while "It is difficult to teach Arabic within a session of less than 30 min," the blended approach allows the teacher to choose how long their classes will be.

4 Challenges of Implementing Blended Learning in Arabic Language Education

Blended learning is an agile approach to education that connects on-campus and online teaching, enabling students to reach instructors at remote locations, share different perspectives and use a variety of resources in their learning. Specifically for Arabic language classrooms, new doors are opened with blended learning for both learners and educators: constant access to educational resources, improved task-based language teaching (TBLT), and being surrounded by authentic cultural

heritage. However, such an approach would be challenging because it involves teachers, heads of institution and students as well and needs an appropriate setting for everyone to participate effectively. This part of the paper will reveal the challenges that blended learning may face in Arabic language classrooms and provide suggestions on how these can be solved.

In blended learning settings, the following is important for educators to refine new teaching skills and methodologies quite different from sophistication resulting from conventional methods. Practice, not explanation or delivery, should be at the center of this environment's classroom time. For teachers to make a transition from information providers and evaluators of knowledge to facilitators of experiences for the students can be demanding in terms of soft-skill acquisition (on creativity and flexibility) and awareness on individualistic academic and personal differences among learners. Also, to create alternative assignments for those with limited access to technology. The demand for swift adaptation and change in teaching practices can also lead to stress for teachers, particularly in situations marked by social, economic, or political instability. Moreover, instructors in blended learning contexts frequently find themselves competing with technology instead of effectively integrating it into their teaching methodologies. It is essential to clarify the role of teachers at both the university and departmental levels, accompanied by suitable training and support initiatives. Establishing a clear framework defining the specific role of educators within blended learning pedagogy is vital in these evolving educational environments [14].

The challenges faced by students in blended learning settings can be categorized into two main areas: those pertaining to technology usage and those linked to the learning process itself. Transitioning to blended learning environments proves difficult for learners who have limited experience with technology. Often, students anticipate that blended learning will mirror online learning, or they may feel apprehensive about utilizing technological tools. These emotional aspects must be taken into account when implementing blended learning strategies. It is crucial to prioritize the development of technological knowledge and skills, especially for students who are less familiar with technology. One effective method to tackle this issue is to improve learners' computer proficiency and Internet skills through summer programs. Furthermore, Arabic language students who have been taught using Grammar Translation or Audiolingual methods will require assistance in acquiring skills suited for the blended learning model [15].

4.1 Technological Infrastructure

Challenges associated with the essential technological infrastructure hinder the implementation of blended learning in Arabic language classrooms. A crucial requirement for blended learning is access to dependable computers and the internet. In educational institutions where computer and internet availability is restricted or entirely absent, genuine implementation of blended learning is unattainable, no

matter the extent of teachers' training in its methodologies and applications [16]. The results of the present study indicated that the classrooms analyzed lack the necessary technological infrastructure to support the effective implementation of blended learning.

Consideration must also be given to the matter of internet bandwidth. Sufficient bandwidth is essential to accommodate the growing reliance on computers for internet access, as inadequate bandwidth can lead to slow connections that render the internet ineffective for various applications, such as blended learning. This challenge is intensified by the reality that numerous classrooms lack adequate computers. Consequently, even with sufficient internet bandwidth, the availability of internet-enabled computers in classrooms remains restricted [17].

Another challenge arises from technical issues associated with computer operations. These problems can manifest in various ways, such as computers failing to connect to the internet due to reasons like incorrect username/password combinations or inadequate signal strength in rural locations, leading to many days of lost learning opportunities. In certain instances, the internet connection might seem functional but is actually unusable, preventing any web browsing. Such complications can dampen teachers' enthusiasm and hinder their ability to implement blended learning, as the essential technological infrastructure required to support this approach remains a significant obstacle, regardless of teachers' levels of training or their confidence in its effectiveness [18].

If these issues are not addressed beforehand, even the most effective training program would become ineffective in its execution. A training initiative that overlooks infrastructure problems would lead to frustration and feelings of hopelessness among educators. Teachers may believe that everything is set up and that all they need to do is grasp how to implement blended learning, opening up their world for teaching and learning, thereby enhancing the value of their work and life.

4.2 Teacher Training and Support

In order to fully leverage the advantages of blended learning within Arabic language education, it is crucial to equip teachers with sufficient training and continuous support aimed at improving their technical capabilities and teaching methodologies. A significant number of educators in Oman are inexperienced with online teaching and learning approaches, leading to doubts about the pedagogical viability of blended learning in both schools and universities, especially for foreign language instruction. Consequently, it is vital to offer teachers comprehensive training, clear guidelines, and ongoing assistance in their blended teaching endeavors.

The successful execution of blended learning hinges on professional development, which is essential at every phase of the process—planning, implementation, and evaluation. The increasing need for educators who can effectively incorporate new technologies into their teaching emphasizes that teacher training and professional development must be a continuous endeavor [18]. Relying solely on preservice education

is inadequate; ongoing professional development is vital throughout an educator's career. While blended training and workshops can offer thorough professional development to assist teachers in adapting to blended instruction, it is imperative that they receive support during the implementation stage in alignment with their institutions' vision for success.

Providing sufficient training and time to adjust to blended learning teaching methods is essential. This encompasses not just training in the technology and tools at hand, but also in the pedagogical approaches suitable for blended learning. It is crucial to emphasize that training opportunities must be active, continuous, collaborative, and integrated into the job, catering to the specific needs of teachers by granting them the freedom to choose and tailor the topics or format of the training sessions.

Alongside training, having support from school-based Academy Learning Coordinators, media specialists, and other academic faculty would help smooth the shift to blended learning. Although LOs played a role in facilitating blended learning instruction, continuous support would aid teachers in reworking LOs internally and modifying their lessons for blended formats. Additionally, the collaborative aspect of on-demand video clips allowed educators to leverage peer best practices to address challenges within the classroom [18].

5 Designing Blended Learning Courses in Arabic Language Education

In recent years, the integration of traditional face-to-face teaching with e-learning methods—commonly known as blended learning—has permeated nearly every area of education. The most common application of this approach has involved asynchronous activities conducted outside the classroom, paired with in-person instructional sessions. Additionally, the delivery of content frequently relies on Learning Management Systems (LMS) and other more conventional technological tools, such as static web pages and online tutorials [19]. Consequently, blended language instruction programs have predominantly centered on various combinations of traditional classroom courses enhanced with online resources like Moodle, Edmodo, or similar embedded online elements. However, the methodologies and approaches of conventional language lessons are often challenging to adapt for the blended learning environment. This difficulty has led to a range of concerns, anxieties, and uncertainties regarding how to effectively transfer content to a flexible, hybrid platform [19].

Moreover, akin to various other fields, the process of convergence and the transfer of technological, methodological, and structural elements has been notably sluggish due to a range of challenges, including institutional, financial, and technological barriers. In the realm of language instruction, blended learning remains largely experimental, with only a few significant initiatives or officially recognized institutional

strategies in place. Many educators find themselves navigating the unfamiliar landscape of innovative active methodologies that arise from integrating technology with the principles of second language acquisition [20]. Concerns and skepticism among educators have been heightened by prior experiences with technology in teaching, alongside a broader recent history of socio-political upheaval affecting perceptions of languages like Arabic, both internally and externally, and its educational implications.

Conversely, the potential that blended learning offers in addressing the unprecedented and untapped openness of educational and cultural issues within a globalized context arguably surpasses the existing challenges. The concerns previously mentioned, whether framed as fears or obstacles, can serve both as a catalyst and a benchmark for defining blended Arabic language instruction. Balancing the necessity of preserving traditional methodologies, philosophical foundations, and strategies—both in second language acquisition and in the transfer of culture and content—suggests that the primary emphasis of blended learning ought to be on social interactions rather than technological advancements. Models that navigate the shortcomings of conventional methods and mitigate the risks of technology overshadowing educational results can be found in the methodologies and frameworks of networked (i.e., satellite) Arab broadcasting. In this scenario, shared virtual social environments where participants co-create content and learn languages, regardless of varying degrees of static traditional and dynamic transactional approaches, could serve as focal points for future applied research, initiatives driven from both top-down and grassroots levels, and emerging plans for collaborative growth [21].

6 Assessment Strategies

The effectiveness of blended learning in Arabic language classrooms hinges on the use of robust assessment strategies to gauge learners' performance and accomplishments. Assessments play a crucial role in evaluating learner proficiency, achievement, and the overall effectiveness of the learning environment, which encompasses both the design and delivery of the instruction, necessitating a variety of assessment methods. This chapter delves into different assessment strategies that can be customized to evaluate learners' performance within blended learning contexts. Assessments are divided into two main types: formative assessments, which are ongoing, and summative assessments, which represent final outcomes; these options can be combined to achieve precise and reliable assessment results. Formative assessment strategies fall into three distinct categories: adaptive assessments, competency-based assessments, and peer/self-assessment [21].

Adaptive assessments are utilized to address deficiencies in learners' understanding and knowledge, tailoring both content and delivery to align with their specific needs. In competency-based assessment, the focus shifts from instructional time to the evaluation of learners' skills and knowledge, determining whether they surpass a set threshold of proficiency. This approach allows for the personalization of learning pathways, enabling learners to select activities and pacing that match

their individual capabilities. Automated peer-review tools can facilitate peer and self-assessment, where learners evaluate each other's submissions based on established grading criteria. This process blurs the line between formative and summative assessments, allowing formative assessments to effectively replicate the outcomes of summative evaluations.

Additional strategies for formative assessment encompass systems for responses or attendance, such as clickers, elements of gamification like quizzes and games, and reflective journals or Facebook pages that track learning advancements, comprehension of content, and allow for the expression of questions and concerns [22]. Summative assessments might employ a product-based portfolio that includes learners' submissions aligned with assessment standards, which could feature developmental work from formative assessments, exams, group projects, or performance portfolios showcasing a collection of video evidence that corresponds with evaluation criteria, such as speaking performances assessed by peers [23].

Comprehensive evaluations encompass holistic assessments that utilize a singular measure, such as a portfolio or exam, as well as analytical assessments that assess various indicators, like the criteria outlined in rubrics. Immediate feedback is produced through auto-scoring based on learners' responses, enabling the documentation of results following the evaluation of each submission. While this type of assessment has limitations concerning the frequency of scoring and feedback, the blended learning model can address these issues by providing extra time for learners to reflect on corrective feedback [24].

7 Conclusion

Implementing blended learning in Arabic language classrooms presents both opportunities and challenges, signifying a shift towards a more dynamic teaching approach that integrates traditional instruction with technological tools. The effectiveness of blended learning in enhancing language acquisition has been clearly demonstrated. It provides flexible and personalized practical learning experiences, which are particularly beneficial for diverse learners who might otherwise struggle with language acquisition. Nonetheless, educators face difficulties in transitioning from a content-driven methodology to an outcomes-based framework. This shift proves challenging due to the significant emphasis placed on technology infrastructure, including the necessary adaptations for these methods, alongside the reluctance of some educators unprepared for such changes. While blended learning introduces certain obstacles, it also offers considerable potential, as it can foster interactive, student-centered environments that better address the needs of 21st-century learners. To effectively tackle the challenges associated with blended learning in Arabic language education, it is crucial to develop strategic plans, provide meaningful professional development, and engage in ongoing research focused on best practices and effective assessment strategies. Accomplishing this will position blended learning as a powerful tool to

advance Arabic language education, equipping learners for the complexities of a globalized world.

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Language, Technology, and Human Agency: Exploring the Impact of AI on Autonomous Decision-Making



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Abstract This research delves into the ethical and social ramifications of autonomous artificial intelligence (AI), particularly within the realms of policing and healthcare. At the heart of this analysis lies the notion of human agency and how AI influences independent decision-making. By investigating the role of AI in processing data and making decisions, the study raises the question of whether these systems are capable of genuine decision-making or if they simply handle information to generate results. It critiques how language shapes the perception of AI as a decision-making force and underscores the potential diminishment of human autonomy in favor of predictive algorithms. Utilizing a qualitative approach, the research reviews current literature and offers an analytical viewpoint on how AI-driven language technologies affect human decision-making. The inquiry also tackles broader philosophical inquiries regarding AI, language, and human agency, particularly concerning the implications of AI decisions in the legal and healthcare fields. Ultimately, the study posits that AI may act as a framework for human decision-making, thereby transforming rather than eradicating autonomous agency.

Keywords Artificial intelligence · Human agency · Autonomous decision-making · Predictive algorithms · Language technologies · Policing · Healthcare systems · Ethical implications · AI · Law

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1 Introduction

This chapter will delve into the ethical and social ramifications of autonomous AI, especially regarding its applications in policing and healthcare. A key focus of this examination will be the concept of human agency; specifically, it will investigate how technology may either uphold human autonomy or diminish individuals to simple operators of predictive algorithms, where their freedom is nothing more than an illusion [1]. Ultimately, the goal is to address questions such as 'Are machines capable of making genuine decisions, or do they merely analyze data to produce a choice?' Additionally, it will critically evaluate the overarching categorization of decision-making tools that aim to personalize or automate actions across various fields of the humanities.

This thesis opens by placing the context of police and health AI within a society characterized by surveillance, from which these decision-making tools arise [1]. Initially, the chapter will delve into the interplay of language and power in the formulation and application of AI, investigating how language serves to [2]:

1. Render data seemingly objective.
2. Portray AI as a decision-maker.
3. Relieve organizations of accountability for AI-related choices.

Following this, it will consider the notion of autonomy alongside the essence of law and its connection to decision-making. Importantly, the discussion will focus on the concept of the networked self, as articulated by Nikolas Rose, arguing that since the networked self is foundational to Western liberal societies, decisions made by AI pose a threat to the very essence of Western liberal autonomy. These points will be illustrated through discussions on the implementation of decision-making AI within the NHS, UK police detention, and civil service hiring processes. In conclusion, the chapter will examine the argument that framing AI's (assumed sensory) distinctions as essential can serve to safeguard human exclusivity in autonomous decision-making, though it may not necessarily uphold human autonomy.

1.1 Background and Significance

Over the last twenty years, artificial intelligence (AI) has experienced significant advancements. In its early stages, AI relied on a rule-based methodology to address straightforward problems. The domain of AI has since broadened to encompass statistical models, modern AI, and a combination of connectionist and expert systems. Another avenue of AI development aimed to create autonomous intelligent agents. These cognitive agents possess the ability to engage with their surroundings, gather knowledge, reflect on their experiences, execute mental tasks, and learn [3]. One crucial human characteristic tied to an individual's sense of agency is autonomous

decision-making. Investigating how artificial agents can autonomously make decisions related to linguistic tasks presents a promising research opportunity. Creating a computer agent with autonomous decision-making capabilities represents a crucial milestone in developing a cognitive agent. It is essential to grasp how AI impacts an agent's autonomy and sense of agency. A deeper understanding enables us to design and utilize computer agents and systems more ethically. The emergence of AI has profoundly transformed various aspects of our lives, particularly in how it shapes decision-making processes, which are often viewed not merely as information processing but as inherently human traits [3]. The influence of AI significantly affects our own decision-making processes. Thus, understanding how AI impacts autonomous decision-making, alongside advancements in decision support, data mining, and intelligent decision theories, is crucial.

1.2 Methodology

The methodology of this research takes a qualitative approach since the relationship between language, technology, and human agency is very complex, more so with AI in relation to autonomous decision-making. The study takes on a descriptive approach in systematically reviewing pertinent literature: scholarly articles, case studies, and theoretical frameworks. This literature serves to provide wide-ranging insights into the current and prospective roles bestowed upon AI regarding the shaping of human autonomy in the context of decision-making. Thereafter, emerging patterns are analyzed; findings are interpreted to provide insights into the ways AI-mediated language technologies impact individual decision-making in order for better assimilation of the interplay between AI, language, and human agency. The descriptive method also helps realize the processes of reasoning that result from the complex interdependence of people with these language technologies.

2 Theoretical Framework

Certainly, a discussion of the very given topic on the effects of Artificial Intelligence (AI) upon independent decision-making cannot be complete without a real and profound analysis of the interrelations among technology, language and human agency. More so, the very meaning of relationships calls for deep reflections and examinations from different perspectives. Starting from an inquiry into the very nature of human beings, it argues a strong case that humans are essentially and fundamentally cultural creatures, with their deep identity entwined in the fabric of being able to speak. This places technology centrally as a means by which to extend or amplify the natural human powers. And it is in this reflective stance that Heidegger famously opens up a reading of technologies as equipment into something where a revealing enjoining presence [4]. Self-styled AI-written: ruminating upon

the profound implications encapsulated within the perennial query of "what-is-it" in relation to any given tool or artefact humans inherently unravel the intrinsic value and functionality of these tools that yearn to be unveiled and harnessed [5].

Stiegler develops Heidegger's entwined horizons of revealing and hiding. He argues that technologies also enable a double retreat: they enable the human to retreat from direct encounters with the world and, thus, from the anxiety that such encounter would produce [6]. Heidegger's flirt with Eastern philosophy championed the unmediated encounter with the world, wherein one is an engaged agent in dealings in the world. By using technologies to avoid the overwhelming encounter with the world, human beings emerge as beings that have a subtle but important kind of agency. It is in this sense that technology indirectly governs encounters with the world. For Heidegger, it is in this sense that technology indirectly governs encounters with the world: by extending human capabilities through automation, to ultimately condition the self-awareness of being. Technologies take their place among other automata, like language and the human psyche, in giving humanism its normative character. The fact that living systems can (self-) organize with their environments strongly suggests that these units create themselves; they do so through dealing with the environment in ways that are (at least partially) predictable. At a second level, it means opening up the machines' engagement with the world to a sufficient degree of autonomy so as to allow for the attribution of decisional functions.

Though the view of what agency is widely all-encompassing breaks human borders, it is within the setting of decision-making processes that most frequently an attribution of agency is lodged against the individual or group related as the decision maker. That is, such an attribution inherently involves a dimension of autonomy with the decision-making process since these individuals or groups are endowed with influential powers of instigating and shaping events and choices [7]. To further situate the discussion, within a very broad energy domain, interests and preferences may take any form for different agents; however, there is a largely spoken consensus that injects emphasis into augmented awareness and control over personal energy consumption patterns. The realization has escalated the phenomenon of prosumers. Prosumers are individuals usually defined as consumer-centrics actively engaging in roles relating to the supply or production of products and their consumption [7]. Yet when we touch down in the realm of reality, we quickly realize that a plethora of intricate factors come into play. They contribute to the (in)ability of individual actors to autonomously make all-encompassing decisions that shape their energy consumption patterns.

Autonomous decision is one of the extremely pivotal and basic concepts in contemporary research on technological innovation and processes of decision making. There has been general agreement on defining an autonomous decision as being independent when it is made without any influence from the outside. For instance, the freedom can be complete while an individual makes decisions with no constraint at all, or it can assume a more structured aspect whereby the subject should produce choices that are automatic and unconscious [8]. In other words, over the past couple of years, autonomous decision-making has slowly begun to be associated with human governance. This becomes especially salient in the case of decision aids, such

as sophisticated AI systems. Human control within this context may be captured in varying dimensions, including visibility to automated decisions, time available for reaction by humans, and potential for intervention by humans in automatic decisions; understanding of automated decisions; and conscious capacity to overrule automated advice. The concept of control, however, also extends to the involvement of the different actors throughout the various stages of the decision-making process: programming artificial intelligence (AI) systems, defining the problem space within which these systems function, and setting up the decision criteria that direct their operation [9]. Truly grasping and successfully realizing autonomous decision-making demands an understanding of the multifaceted nature of control in decision aids and involvement of actors at different levels. This holistic approach views empowerment for making informed choices as important, while keeping in view the capability (and limitations) of AI systems. By striking the right balance of autonomy versus control, we will be able to maximize what can be gained from autonomous decision-making in terms of boosting efficiency plus accuracy, and quality of decisions overall.

3 The Role of Language in Autonomous Systems

The language use in autonomous systems could be a building block for interfaces and cooperation between people and machinery that are more intuitive. Presently, the function of language within autonomous systems is predominantly situated in AI technologies, notably NLP and NLG [9]. Yet, the vision of 'conversational AI' might be cast under shadows if it does not match decision-making authority and entailed responsibility to that of a human conversational partner. In other words, NLP and NLG at the intersection of AI might mean progressively more intricate uses of language for machines, but coupled with intricate implications on who gets to have agency over the 'decisions' that will be acted upon based on the skills manifested through this capability. For example, the integration of NLP/NLG into warehouse robots might result in a more complex approach for humans to talk to those robots, but it is also a step further regarding how robots can, based on these functions, figure out how to handle routing goods or where and how to pick up or shelve products [10]. It may be employed to develop independent processing within autonomous technology, to enable cooperation between a human and a machine, or accomplish both. The attention is drawn here to the former use, and precisely how autonomous system abilities in language are presumed to back the execution of decision-making by these systems. The curiosity is then motivated by an orientation to the implications of language development among autonomous technologies specifically in respect of supporting autonomous decision-making.

NLP is a most crucial field within AI and ML, more especially for autonomous systems and acting on the human side. Comprehension of written or spoken words is a basic prerequisite for functionality of an individual in society. Words can be used to depict the world; they are a means of delivering perspectives on the world's ideas and values, and they reveal the mind and heart of the speaker or writer, exposing intentions

as well as shedding light on someone's behavior [11]. This function's implementation in an automatic way is what gives systems the ability to make independent decisions and has a big effect on their ability to operate in a human-centered society. Current progression within the NLP field is making more room for agency. This represents a shift from decision-making processes about functionality alone to treat words as isolated shapes in their immediate context of use, bearing no inherent meaning. This shift in the NLP community towards agency recognizes important connotations within the words themselves, which refer to the broader context they are exchanged [12]. Deeper into the intricacies of agency, NLP explores information with the potential to enable better interpretations and responses by autonomous systems regarding human interactive behavior. Recognition and understanding agency in language introduces a new plane of understanding and interaction between machines and humans. Looking at it that way, autonomous systems are able to not just consider words during processing but also the purposes, desires, intentions, and emotions lying underneath the surface. Enabling such higher cognitive processes over information systems opens plenty of opportunities in how humans will engage with machines to realize some really productive and meaningful outcomes.

Prediction analytics is a very exciting and rewarding field of research for making reliable and actionable predictions. State-of-the-art machine learning models can be trained to predict with an accuracy not attained before when discriminating and identifying deeply relevant propositional content, making them ideal tools for operational decision support [13]. The sealed display provides the deep, impenitent projection of confidence. It integrates an event of interest and the certainty of allegiance with assurance from the information obtained at the event within that time-fixed context. Further, this is crucial to note that the old reasons, which were earlier killed, could be revived against juxtaposed technology, disregarding once again new schemes or plans, giving way to fresh situation or occasion that was unprepared for. Yet the subtleties and aspects of complexity are extremely far beyond such a simple contrast to words that one might paint them as evergreen. The fast pacing environment tech companies have constructed through web-based communications and absolute explosion with the social media platforms, have seriously added weight upon the edifice of language use; creating plentiful amounts of data and drastically transforming both the view as well as depiction of events [14]. These high frequency channels of communication, like Twitter or comments sections on news sites, have totally shifted the whole paradigm and in doing so, have redefined not just how language is used, but how data is produced, meaning how events are viewed and framed, forever changing the way we understand the world and our place in it.

4 Moral Implications of AI in Decision-Making

With the inhuman aspects, the accountability of artificial decision-makers in a human environment is considered to raise numerous moral and ethical issues. Some of the first arguments that come to mind are based on the possible ethical harms of delegating ethical decision-making responsibilities to technical systems and, eventually, to the humans who operate, maintain, and program them [15]. A big body of work that has already been done starts looking into this from many different points of view. The part on responsible design raises questions on what are the considerations and responsibilities in technological development. A central issue manifests fears that AI systems might be biased, unfair, and act unjustly in particular. This might be because of what if they replace people's judgment, helping or ensuring unfair and unjust decisions [16]. Human users might experience inequity in the distribution of work—more of the mundane, routine, well-defined items-of-work could be done by AI [17]. People get called in only for the interesting cases or when the going gets tough. This borders closely on another concern that increased automation and AI offloading might have accountability implications, meaning that the technical decision-makers are not going to face the same kind of sanctions that humans are exposed to on a daily basis, in addition to holding no moral evaluation of their work. The demand for transparency—even accountability—to be coded into a system to scrutinize the decisions made is called "algorithmic accountability" [18]. Moreover, techniques involved in making AI more accountable thus, transparent in its operation are becoming a burgeoning part of intense research today in moral philosophy and industrial practice. With a design challenge for software engineers, users have appropriate information regarding system outputs for which they have been given decision-making responsibility [18].

This has to do with models that create biased predictions and may have been created by machine learning algorithms trained on historical data. The underlying data may be biased and, hence, contain inequities, meaning that outcomes will be biased as well. The value of fairness entailed in algorithms is one of the most frequently noted among the ethical challenges in AI [19]. There have been so many other highly publicized cases where companies have released algorithmic decision-making systems with unwanted or unexpected biases (e.g., discriminatory AI hiring tools or risk prediction algorithms for criminal justice). In deciding where to draw the line in terms of the links that technology companies should have with governments; that companies must offer tools to detect and fact-check misinformation. This meshes with the fact that just in recognition in the last few years there has been the articulation of so many different philosophical definitions of algorithmic fairness. Algorithmic fairness is the concept that machine learning algorithms and what they produce are fair and unbiased. This is an area of considerable challenge and handles the societal concerns that come off using AI, which might harm people [19]. The effects of biased algorithms could be very large since they might affect people in society and community scale, disproportionally such as based on race or gender or even socioeconomic factors. The need for algorithmic fairness has initiated efforts

both within the research community and among policymakers for laying down appropriate frameworks and guidelines to curb bias and foster equitable outcomes within AI systems. One common approach to achieving algorithmic fairness is through "fairness-aware learning," where algorithms are developed to learn explicitly from the training data sensitivity with the desired fairness metrics [20]. By expressing fairness constraints within the optimization objective, such algorithms work on lowering biases to leave the resultant models free from discrimination against individuals or any given group. Indeed, achieving fairness can be very challenging since unfair trade-offs among the fairness and other desirable objectives (accuracy or efficiency) normally exist. Accordingly, finding the right balance is a real challenge that has to be pursued continually with microscopic attention. Transparency and accountability are other important aspects of algorithmic fairness. Transparent regarding the data, algorithms, and possible biases within the system when deploying AI systems, organizations are better placed to handle external scrutiny for identification and redress of biases. Mechanisms of account-ability need to be strong enough to address situations in which there are biased out-comes, allowing, for instance, contests and appeals related to decisions made by automated systems. It also includes mechanisms of redress and compensation in case harm results from the application of biased algorithms. Technical and policy-oriented measures are not enough; given the size of the AI community, more diversity and inclusivity also play a vital part in achieving fairness. Having different viewpoints and experiences will most likely draw attention to biases that might have been ignored otherwise. Encouraging initiatives to diversify AI research and development, as well as including voices in decision-making processes regarding AI systems, can go a long way to make the outcomes more equitable [20].

Proposed by diligent researchers, a comprehensive framework for fairness coordinates well with a comprehensive legal framework and demonstrably locates its different dimensions in place in spirit and letter within existing laws and charters [21]. The idea of fairness is also strongly debated in domains of medical and military decision-making processes [22]. This indicates the great likelihood of its far-reaching acceptance [23]. Hence at least three highly important subgroup analyses must be deemed extremely important [24]. This increasingly becomes so evident in this context [21, 25]. These are, first, a smart 'first step' in delivering unprecedented fairness to members of certain subpopulations, and eventually executing actionable implementation of customization at levels higher than the individual without those models being held up due to potential blowback (or, even better: without those models being held up due to concern about blowback on healthcare costs); second, it is very laudable that he has recognized disparity in getting the exact risk measured and consequential results- and the resulting evidence can come out like a strong weapon in legal challenges that investigate whether or not these algorithms are consciously contributing to discriminatory tendencies; and, third, an absolutely unique field of more study and more pioneering work that is achieved in one of the most fascinating areas in federated learning which is completely separate, enthralling domain, with respect to just fairness as focal and enchanting goals: it really pushes the boundaries of knowledge and innovation [21, 26].

5 Conclusion

This chapter has outlined different ways in which AI and language can be said to interact in shaping human autonomous decision-making. Also, it has been argued that the use of AI does not restrict or control human agency (in other words, that AI use does not present obstacles to human agency), but rather functions as a form of 'scaffolding' capable of changing the space or affordances of human decision; making. Furthermore, it has been demonstrated that AIs' access to individuals under legal decision-making is not unique. Building on those insights, our central aim has tried to answer what 'channels for change' AI and language may open, through transformation of decision-making by affordance. Larger themes which then emerged across the papers included the relationship between knowledge and belief, between reasons and rationality, between risk proxies and legal norms, impacts on rights and representation, and the limits of language. There are important issues which remain to be addressed. If the future of NLP might indeed turn away from scale procedures made available through a middle tier of application, then we might look at a research agenda for AI which was about building tools to enhance autonomy, understanding and a reasoned and moral commitment. In other words, if NLP becomes the kind of commitment we think it might be, that is, learning directly from natural language, then the tools we might be most concerned with building are those that increase our understanding of the social and linguistic capacities than substituting for them.

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Digitization and Laws Related to Loans: A Comparative Study Between Bank Loans, Mortgage Loans, and Syndicated Loans



Yasar Alhiniti, Muhammad Nader Doshan Al-Madi, and Abeer Mazen Alamayreh

Abstract This research differentiates bank loan contracts from other similar agreements, like syndicated loan contracts and mortgage loan contracts, by examining their similarities and distinctions. It evaluates the characteristics of each loan type while emphasizing the differences in involved parties, aims, and legal ramifications. Key findings reveal that a bank loan contract is defined by a direct relationship between the bank and the client, serving multiple purposes. Conversely, a syndicated loan contract necessitates collaboration among several banks to facilitate a substantial loan, coordinated by a lead bank. On the other hand, a mortgage loan contract is centered on financing real estate endeavors backed by specific property guarantees. Furthermore, the study addresses the influence of digitization and technology on the management and structuring of these loans, noting the implementation of digital systems to streamline the loan application process and ensure compliance among the parties involved. It also points out the absence of specific legal regulations for these contracts, highlighting the need for the creation of specialized legislation and the improvement of legal frameworks to keep up with technological progress and provide adequate protection for all parties involved. Utilizing a descriptive methodology, the study collects data from legal and financial literature and analyzes the pertinent laws and regulations for each loan type, offering valuable insights into the regulation and application of these contracts amid the effects of digitization and technology.

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1 Introduction

The evolution of the banking system, which serves as the foundation for economic development, has been driven by economic advancements and the integration of scientific progress. Furthermore, these economic changes have played a significant role in broadening the range of functions performed by banks, particularly in the area of banking loans. Central to the operations of commercial banks, banking loans play a vital role in fostering economic activities and subsequently boosting national production. By financing and supporting economic and commercial initiatives, loans aim to meet the requirements of borrowers [1].

Loans represent the foremost application of funds held by commercial banks, with the act of lending to clients being the primary service offered by these institutions, which ultimately drives their profitability. A crucial instrument that banks utilize in their operations is the revenue generated from financing and lending, typically referred to as interest [2, 3]. Interest is essential for funding economic initiatives and plays a key role in economic policy, being one of the most significant tools that influence the stability of monetary policy [4–7].

Although the banking loan contract holds significant importance, the Jordanian legislator has not deemed it essential to establish specific regulations for it, opting instead to depend on the conventional general rules that govern loan contracts as outlined in the Jordanian Civil Code. It is important to highlight that while the provisions regarding legal interest have been structured by the Jordanian legislator, this regulation lacks balance and consistency [8–10]. Instead, these laws have been arranged in a disjointed fashion, with certain aspects plagued by ambiguity and others suffering from deficiencies and disorder [11].

The topic of banking loan contracts has ignited discussions within legal jurisprudence, especially concerning the economic disparity and the unequal contractual equilibrium between the more powerful party (the bank) and the less powerful party (the borrower) [12–14]. This scenario necessitates firm legislative action to ensure legal safeguards for both parties involved in this contract, with particular emphasis on protecting the weaker party, while striving to reestablish equilibrium in the banking contract [15]. Analyzing the judicial precedents from the Jordanian Court of Cassation reveals a notable inconsistency and instability in judicial decisions along a specific trajectory, leading to a shortfall in judicial protection that would aid in restoring balance between the parties to the banking loan contract. This is the clarification the researcher intends to provide in this study.

1.1 Study Objectives

This study aims to fulfil the following:

1. Comparison of the bank loan agreement with the syndicated loan agreement and the mortgage loan agreement, highlighting the differences and similarities of the parties involved and their objectives.
2. Examine the impact of the lack of specific legal regulations on the management and organization of various loan agreements in accordance with the general principles of civil law, commercial law and banking law.
3. Explain the objectives of the bank loan agreement, syndicated loan agreement and mortgage loan agreement and understand how each type serves different needs.
4. Examine how legal regulations affect the application and interpretation of loan agreements from a legal and regulatory perspective.

1.2 Study Methodology

This study employs a descriptive approach to examine and interpret the similarities and differences among banking loan contracts, syndicated loan contracts, and mortgage loans. Relevant legal and financial literature is reviewed, and legal rulings concerning these contracts are analyzed to gather data. By utilizing the descriptive analysis method, the research identifies the commonalities and distinctions in the parties involved, the objectives, and the legal implications of each loan type, offering an extensive perspective on their regulation and application within the legal and financial framework.

2 Previous Studies

- Study [16]: The researcher elaborated on the terminology associated with bank interest for financial institutions and explained the stance of the Jordanian legislator regarding this matter. This study stands out from prior research due to its thorough examination of bank interest, especially concerning the allowance for its modification throughout the duration of the loan contract and how both general and specific principles in contract theory address fluctuations in bank interest.
- Study [17]: This research examined the characteristics, forms, and amount of legal interest. What sets this study apart from earlier investigations is its analysis of the bank's capacity to modify the interest rate throughout the duration of the loan agreement, as well as the conditions required for the bank to legally make such adjustments in accordance with the regulations that govern banking loan contracts under Jordanian law.

- Study [18]: This research focused on the aspects of the banking loan contract, examining its definition and how it differs from other types of contracts. Additionally, it detailed both the formal and substantive requirements of the banking loan contract along with the effects that arise from it.
- Study [19]: This research examined the governance of interest rates across all banking agreements and how these rates are modified in accordance with legal requirements and extraordinary situations. What sets this study apart from others is its distinctive explanation of the public economic order's influence in defining the bank's power to alter the interest rate arising from the banking loan agreement.

3 Differentiating the Banking Loan Contract from Similar Contracts

The banking loan contract exhibits resemblances to various other contracts, which can create confusion and complicate differentiation. Consequently, the researcher found it essential to explore these similarities and distinctions in order to clarify the differences between the banking loan contract and comparable agreements. This differentiation will specifically aim to set apart the banking loan contract from both the syndicated loan contract and the mortgage loan contract.

3.1 Differentiating the Banking Loan Contract from the Syndicated Loan Contract

The distinction between the banking loan contract and the syndicated loan contract lies in the following.

A syndicated loan contract is defined as an arrangement involving a borrower and two or more financial institutions, which facilitates the provision, organization, and management of bank credit under shared terms specified in a single document. In this arrangement, each financial institution contributes a designated or separate sum of money, with the borrower agreeing to repay the borrowed amount, along with the associated interest and fees, within the established timeframe(s) [20].

A syndicated loan is characterized as a lending agreement involving a consortium of banks on one side and a borrower on the other. In this arrangement, one bank is granted the authority by the lending banks to execute specific terms of the contract, which is governed by the practices of the involved parties and banking customs [21]. This type of loan typically refers to substantial transactions that individual banks or financial institutions might struggle to manage independently, whether due to the scale of the funds involved, a desire to share risks, or lending limitations that restrict large amounts being lent to a single borrower. What sets this loan apart is the considerable growth and expansion it entails [19, 22].

From the information presented, it is evident that the aim of utilizing this kind of loan is to address the considerable financial requirements of borrowers, which frequently surpass the capacity of a single bank to fulfill due to the loan size exceeding the bank's financial resources. Typically, in such scenarios, the borrower is a legal entity rather than an individual [16, 23].

The parties involved in the syndicated loan agreement include the borrower, who seeks to fulfill their financial requirements, uphold their financial reputation, and enhance their creditworthiness; the participating banks [24–26], which focus on ensuring adherence to lending standards; and the lead bank, acting as the third party authorized by the borrower to arrange the syndicated loan [27]. In Jordan, there is no specific legislation governing the provisions of the syndicated loan contract, leaving it to be regulated under the general principles outlined in Articles (636–646) of the Jordanian Civil Code, which addresses loan agreements [17, 28].

Conversely, the syndicated loan agreement qualifies as a commercial contract governed by the stipulations of Jordanian Commercial Law, which classifies banking activities as commercial endeavors due to their inherent nature [29]. Since participating banks are among the involved parties in this agreement, it is also required to comply with the regulations outlined in the Central Bank Law, given that the central bank serves as the regulatory authority overseeing banks and directing monetary policy. Furthermore, it must conform to the provisions of the Banking Law, where the legislator determined that this agreement is a commercial contract applicable to all parties concerned [1, 30].

From the above, the similarities between the banking loan contract and the syndicated loan contract can be observed as follows [31–33]:

- Concerning the absence of legal oversight: Both agreements lack specific legal regulations, as the Jordanian legislature has not established particular laws for these contracts. This gap allows for the application of general traditional principles from the Civil Code, along with certain provisions found in the Commercial Law, Banking Law, and Central Bank Law [4, 34].
- Both agreements are alike in that they are considered innominate contracts, since the law has not defined their terms or assigned them a specific title.
- Both agreements share similarities as they represent types of loans that provide credit to the borrower [11, 35].

The differences between the two contracts, according to the researcher, can be identified as follows [36, 37].

- The parties involved in the contractual relationship distinguish the banking loan contract from the syndicated loan contract. In a banking loan contract, the customer and the bank are the contractual parties, while in a syndicated loan, the parties consist of the borrower, the lead (organizing) bank, and the participating banks [15, 38].
- The banking loan agreement varies from the syndicated loan agreement regarding the borrower; in a banking loan, the borrower may be either an individual or a legal entity, while in a syndicated loan, only a legal entity qualifies as the borrower.

3.2 Differentiating the Banking Loan Contract from the Mortgage Loan Contract

A mortgage loan contract is characterized as an agreement designed to offer the essential liquidity needed to execute and conclude a real estate transaction. Additionally, it is described as a tripartite arrangement involving the financier, the property seller or contractor, and the investor, whereby the financier extends a loan to the investor for the purpose of funding a real estate endeavor. The investor is responsible for repaying the loan through periodic payments, which are secured by a lien on the property, a mortgage, or other contractual assurances [16, 39].

The mortgage loan contract has not been explicitly regulated by the Jordanian legislator, which means it falls under the general provisions concerning loan contracts outlined in Articles (636–646) of the Jordanian Civil Code. Additionally, since a bank is one of the parties involved in this contractual arrangement, the terms are also governed by the stipulations of the Jordanian Banking Law No. 28 of 2000, along with its amendments [17, 40–42].

The similarities between the two contracts, as seen by the researcher, are as follows.

- Concerning the absence of legal oversight, the two contracts share similarities in their lack of legal regulation, since the Jordanian legislator has not explicitly addressed their terms, allowing for the use of general principles from the Civil Code and specific rules from the Jordanian Banking Law [18, 41, 42].
- The two contracts share similarities, as the mortgage loan agreement is regarded as a type of banking loan contract [20, 42, 43].

The differences between the two contracts, as observed by the researcher, are centered on the following [19, 36, 37, 43].

- The parties involved in the contractual relationship distinguish the banking loan contract from the mortgage loan contract. In a banking loan contract, the involved parties are the client and the bank. In contrast, the mortgage loan contract features a different set of parties, which includes the financier (the bank), the seller of the property, and the investor (the beneficiary) [21, 28, 31–33].
- The banking loan contract is distinct from the mortgage loan contract regarding the contract's purpose and objective. While the mortgage loan contract is solely focused on real estate transactions, the banking loan contract's purpose can differ based on the borrower's intentions for acquiring the loan amount [22, 24, 25, 29].

4 Conclusion

This chapter gives a detailed analysis of the variances and similarities between three separate loan agreements: bank loan agreements, syndicated loan agreements, and mortgage loan agreements. In addressing how digital technology has affected the

structuring and maintenance of these contracts, the study seeks to answer questions on how technological progress has redefined the sphere of financial deals. The research indicates that each loan contract within each sector has its own typical features that make it different from other contracts. The usual banking loan contracts are, typically, a direct agreement between a single lender and a borrower—aimed at providing financial accommodation of individual or commercial needs. Legal implications in such contracts are usually simple, centering on the obligations of the borrower to repay and the entitlement of the lender in case of any default. Syndicated loan agreements involve multiple lenders teaming up to offer a large loan to a single borrower—typically, for large corporate or governmental projects. This is more complicated in managing related risks and rewards that would need coordination among multiple parties. The legal implications are also more sophisticated as the contract has to specify the roles and responsibilities of each of the lenders involved as well as any decision-making or dispute resolution mechanisms. Mortgage loan contracts revolve around one major thing: the financing of real estate property, where the property itself acts as collateral. These are significantly different types of contracts with very specific legal issues, especially about property rights and the foreclosure process if there is non-payment. The goals of mortgage loans are typically long-term in nature, looking at the ability of the borrower to repay over an extended period. The study reveals that though these loan agreements may vary in terms of the parties, goals, and legal structures, all of them are very significantly impacted by the impingement of digitization and technology. The organization and management of loan agreements have been facilitated by digitization, which has furthered efficiency while cutting out error possibilities. Technology has also played a role in ensuring transparency plus visibility in these contracts for loans, thus allowing an easy monitoring and management of the agreed loan terms and conditions. Notwithstanding these benefits, it draws attention to the discerning scrutiny that needs to be applied to such legal and ethical considerations with implications on an increasing reliance on digital technologies in financial agreements.

4.1 Results

The study reached the following conclusions.

1. Banking loans involve several types of contracts. These are banking loan contracts, syndicated loan contracts, and mortgage loan contracts. The nature, structure, and features of each of these distinguish one from the other—addressing different financial requirements and goals.
2. A banking loan agreement is usually defined by the relationship between the bank and a customer, be it an individual or firm. This contract may be used to finance a variety of needs based on specific customer needs. Because of its basic nature and adaptability, this agreement can be used for many different financing needs: from private personal loans to corporate funding.

3. A syndicated loan agreement contrasts with it by having multiple banks collaborate to offer a large loan to the borrower, typically in financing corporate or governmental projects. In such an arrangement, a major bank—termed frequently as the syndicate leader—puts in order and manages the loan. The other participating banks that are contributing towards the amount of loan share the risks related to it. In this way of structuring, resources and expertise are pulled together so that projects can be financed which no single bank would be able to handle alone.
4. A mortgage loan contract is the most specific on financing real estate transactions. This type of contract has three main parties: the property seller, who is also the debtor, the financier (usually a bank), and an investor or buyer. The key feature of a mortgage loan is that it provides for the granting of personal real estate as collateral security for a loan. Legal implications in mortgage loans are usually more intricate because property rights are featured, with foreclosure proceedings in case of default.
5. Though the loan types may differ, they share one common problem: the absence of specific statutory regulation. They are based on general rules of civil law, commercial law, and banking laws. The application of these general rules may lead to uncertainties and contradictions in the interpretation and implementation of loan agreements.
6. The chapter stresses the need for an effective regulation of loan-related laws to specify the provisions applicable to different types of loans. General laws can only provide a framework. The absence of specialized legislation will leave critical gaps that may also complicate the legal landscape further. There is an increasing need for more specific legislation, growing with it, to address these gaps and clarify the rights of all parties taking part in loan contracts, which should provide adequate protection for them.
7. The study results reveal the existence of very grave problems in the application and interpretation of loan agreements, primarily through legislative means. Such challenges reinforce the need for more specific laws that will guide the formation, implementation, and enforcement of loan agreements to protect the interests of both parties and enhance increased legal certainty in the financial sector.

4.2 Recommendations

1. There are particular legislative measures for banking loan agreements, syndicated loan agreements, and mortgage loan agreements. It is important to ensure the clarity of rights and duties for each party that has entered into these contracts. The existence of such legislation will specify different types of loans within a legal framework by defining the terms, conditions, and legal repercussions of each loan type. This reduces vagueness in financial contracts and helps build more trust in such agreements.

2. Amendment of the existing loan-related statutes is very vital in filling the legal lacunae that exist under the regulation of different loan agreements. Creating more detailed laws can help protect the interests of both parties (lenders and borrowers) and other stakeholders to ensure that they are well protected at every stage of the loan.
3. The development of a specific legal framework defining the provisions and terms of different loan contracts is key to reducing disparities in interpretation and application. Standardization of terminology and concepts used in loan agreements, as well as guidelines for enforcement, would help eliminate conflicts and misinterpretations. More so, because this chapter has argued that varying parties usually interpret these agreements differently.
4. Improving the training programs of employees of banks and financial organizations regarding the laws on various types of loans will make compliance effective. Specifically, providing those that work in this sector with an in-depth knowledge of the legalities in loan contracts will help ensure proper risk management and protection of entitlements for all stakeholders.
5. This is to mean that there is the need for enhanced oversight because it is through this oversight that implementation of what has been agreed in the loan contracts between these two parties would be enforced. Effective oversight in this regard helps protect the finance sector from possible risks like those of default or even fraud, among others, in that they will ensure that loans are managed prudently as well as within the legal framework set up for them. This eventually contributes towards the stability and soundness of the whole financial system.

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Development and Design of Training Programs: The Role of Technology in Enhancing Implementation and Evaluation



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Abstract The objective of the study is to examine the essential principles and foundations for creating training programs, the conditions required for their success, and the phases involved in their preparation, all aimed at enhancing the effectiveness of training initiatives within educational institutions. A descriptive approach was utilized to gather and analyze data to meet these aims. Findings revealed that the design of training programs should adhere to principles like inclusivity, planning, and development, highlighting the importance of gradual content delivery and regular program updates. Additionally, the success of these programs is contingent upon their alignment with institutional needs, the establishment of clear objectives, participant empowerment, and performance assessment, while also adapting to cultural values, utilizing technology, and engaging international stakeholders. Concerning the stages of program preparation, the study underscored the significance of conducting needs assessments, followed by program design, implementation, evaluation, and ongoing development, emphasizing the necessity for interaction among these phases to guarantee effectiveness. In light of these findings, the study advocates for the application of the identified principles and foundations to ensure that training programs are inclusive and effective, creating the necessary conditions for success, and prioritizing the interaction between preparation stages to achieve exceptional outcomes and continuous improvement.

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1 Introduction

Training programs serve as a crucial foundation for enhancing individuals' skills and increasing their efficiency in task performance. For the effective design and implementation of these programs, such a comprehensive understanding of the training concepts and objectives is important to be able to realize optimal benefits that flow [1, 2]. The comprehension will outline core principles and foundations governing program design—as well as key conditions needing to succeed [3, 4].

There is currently a developing recognition among organizations worldwide about the need to create training programs as a vital strategy to enhance the skills and competencies of their workforce [5, 6]. We are observing a notable transition towards prioritizing skill development, where training initiatives act as a powerful mechanism for enhancing both individual and team performance, ultimately aiding in the fulfillment of strategic objectives set by the institution [7, 8].

Saudi Arabia is placing greater emphasis on training initiatives, recognizing their vital importance in cultivating the skills and competencies of the workforce. In the context of swift economic and technological changes, the Kingdom's objective is to boost performance and productivity through investments in employee training, ensuring that individuals are equipped with the essential knowledge to tackle upcoming challenges [9, 10].

Given the increasing enthusiasm for establishing training programs, this study investigates the notion of training initiatives, emphasizing the core principles that underpin their development and examining the guidelines that shape the design process to meet specific training goals. It also highlights the critical factors necessary for the success of these programs and outlines the various phases of their development, from planning through to evaluation. Furthermore, the study considers the challenges associated with executing training programs and assesses the present landscape of training in Saudi Arabia, delving into the difficulties encountered in the implementation of these initiatives within the Saudi framework.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Identify the fundamentals and principles that should be considered when designing training programs to ensure their quality and effectiveness in meeting the needs of training participants.

- Identify the basic conditions and requirements for the success of training programs and achieving the desired goals.
- Identify the challenges and difficulties that may arise during the implementation of training programs and how to effectively deal with them.
- Analyze the current state of training in Saudi Arabia and identify challenges and opportunities for improvement.
- Provide practical recommendations based on the study results to improve the processes of designing and implementing training programs in institutions.

1.2 Study Methodology

To attain its objectives, the study used a descriptive method. It involves data collection and analysis of data related to the topic under study through a description of facts in detail. By employing this descriptive method, the study gives an extensive overview of the existing state of training programs in Saudi Arabia, citing their strengths and weaknesses while looking at the problems they face. The methodology pursues the following aims: to study the features of training programs; to measure their efficiency and effectiveness; and to make recommendations based on a complete analysis of research material. The descriptive approach aids in presenting a situation as it is found at present with regard to how training programs were going to be improved and developed based on past results so that they could meet current needs and challenges.

2 Training Programs

2.1 The Concept of Training Programs

For a complete comprehension of the training programs' concept, it is very important to have a look at what training is because this idea plays as a base on which training programs are developed and implemented [11, 12]. The term training has attracted significant attention in different fields, particularly in the humanities like management science and behavioral and educational sciences, due to its major contribution toward improving the skills and effectiveness of human resources [5, 13, 14].

The research carried out by [6] defines training as the continuous activity that aims to increase the skills and knowledge of individuals. This entails identifying their needs, designing appropriate training programs to meet these needs, selecting effective methods, and evaluating the results to achieve the goals set for training programs. In another way, training can be viewed as a vehicle through which experiences, skills, and knowledge are transferred in delivering training services to individuals or groups in social and service organizations. It is aimed at enhancing performance to be able to meet the challenges and problems met in their places of work, thus being on par with institutional strategic goals [8, 15].

Al-Shuhumi [7] pints out that training is an organized activity aimed at bringing about significant improvements in the knowledge, skills, and behavior of the trainee. Indeed, they are better able to perform their jobs and be more productive. In his own explanation regarding training programs, [3] describes them as specific sets of well-coordinated and preplanned activities designed to impart the necessary knowledge and skills related to the job while also enhancing the capabilities of trainees in terms of behavioral development.

According to [11], training programs are structured efforts focused on enhancing individuals' skills and knowledge in particular domains, ultimately aimed at boosting their performance and efficiency in the workplace or other contexts. These initiatives are viewed as a crucial component of human development strategies and are executed through various activities and educational resources tailored to meet specific goals [16, 17].

Drawing from these definitions, the researchers characterize training programs as systematically arranged initiatives designed to help trainees enhance their performance and cultivate their skills through engagement in training workshops [18, 19]. These workshops provide opportunities for participants to acquire new cultural and professional experiences, thereby improving their proficiency in job-related tasks [20–23]. Notably, training programs aim to accomplish several essential objectives, which include: closing the gap between established performance benchmarks and actual performance to ensure effective results, fostering individuals' willingness to work by boosting their motivation and productivity, elevating morale through the enhancement of their interests and skills at work, developing individuals' competencies and preparing them for advancement to higher positions, increasing productivity by equipping individuals with the latest insights on scientific and technological advancements, and promoting organizational adaptability to workplace changes by enhancing the flexibility of trained individuals [3, 24–26].

2.2 Foundations of Training Programs

As stated by [8], three key principles underpin effective training: the caliber of the training activity within the organization, the provision of favorable conditions for the successful implementation of the training program, and the competence of the training team. The foundations of training programs are established based on these principles:

- **Inclusivity**: The training plan should include all employees in the institution.
- **Planning**: Training should be based on a carefully considered annual plan.
- **Continuity**: Training should start before the employee begins their role and continue throughout their career.
- **Dedication**: Attending training requires the trainee to be relieved of their job responsibilities on training days.

- **Application**: The training program should include practical, hands-on elements alongside theoretical content.
- **Realism**: The goals and activities of the training program should be close to the trainee's reality to enable the application of what has been learned.
- **Gradualism**: The training program should be designed progressively from simple to more complex levels.
- **Development**: The training program should be updated in content and method to keep pace with advancements in the field.
- **Participation**: Training is a collaborative process between the trainer and the trainee, allowing trainees to share their experiences and insights.
- **Respect**: Mutual respect should prevail among all participants in the training process, both inside and outside the training room.
- **Practice**: Includes internal training management to provide participants with practical and applied experiences.
- **Commitment**: Trainees must commit to attending the training program when nominated, including their own and their supervisor's commitment.

2.3 Principles of Designing Training Programs

According to [3], when designing training programs, the following principles should be considered:

- Training is a continuous and essential activity that extends throughout the professional life of an individual and involves all administrative levels.
- Training is considered an integrated system consisting of interconnected parts that work together to achieve their goals, which are aimed at increasing the efficiency and productivity of employees.
- Training should be in line with the latest scientific achievements, technologies and methods in the field.
- Training should cover all functions and specializations and be comprehensive in relation to all aspects of work.
- Training should be realistic, correspond to the levels and capabilities of individuals and meet their real needs.
- Training should be carried out in accordance with the duties and tasks of the trainee.
- The training timing should be adapted to the schedules, conditions and work requirements of the trainees.

2.4 Conditions for Successful Training Programs

Zala-Mezö et al. [27] pointed out several essential conditions to ensure the success of training programs:

- The training program should be in line with the requirements and characteristics of the organization to ensure its effectiveness and relevance to practical reality.
- The concepts and objectives of the training program should be clear and easy to understand, making it easy for participants to understand and apply.
- The success of the training depends on enabling participants to practically apply in their work what they have learned.
- The program should gain support and acceptance from participants regarding changes or new skills to ensure their implementation in their work.
- The training should involve all relevant parties in the organization to ensure wide dissemination of new knowledge and concepts.
- Successful training programs require mechanisms for performance evaluation during and after implementation to regularly make improvements and ensure that the program goals are achieved.

Singh et al. [19] added additional conditions for the success of training programs:

- Training programs should be designed to be consistent with the local cultural values and educational needs of target communities, as adapting programs to the cultural context increases their effectiveness and participant acceptance.
- Training programs should leverage technology to enhance digital literacy and innovation.
- International and external stakeholders should be engaged to ensure access to new and up-to-date information, enabling organizations to benefit from a variety of international experiences and expertise.

2.5 Stages of Preparing Training Programs

According to [8], preparing training programs involves five main stages:

Analysis Stage.

The first and very important phase in the training process is this stage as it is the cornerstone for ay successful training program. It involves needs identification and assessment for targeted trainees as well as probing into their personality plus SWOT analysis. Also included in this analysis are the examination of training objectives and the identification of resources needed to achieve those goals [5]. This stage underscores a variety of information sources, comprising organizational data alongside individual perceptions.

Design Stage.

The analysis results are reviewed to select and sequence the content that will enable identifying and organizing what has to be given to the trainees. Also included in this phase is the selection of appropriate instructional methods, technological resources, decisions regarding delivery mode, and the training budget. Designing a training program is founded on some basic principles: clarity and realism of objectives,

degree to which training addresses trainee needs flexibility and maintainability of the program, integration with modern technology [8]. The essential steps involved in creating the training program include [9]:

- **Defining the Objectives:** Establishing clear and attainable goals for the training program involves identifying the key topics and crucial knowledge that the program intends to impart, as well as defining the expected outcomes. Goals must be appropriate, realistic, and quantifiable in order to assess the effectiveness of their achievement [10].
- **Determining the Content:** All topics and information to be addressed during the training are included, based on objectives that were established earlier, guaranteeing that essential knowledge and skills required by the trainees are covered. Program effectiveness is improved through suitable content selection. This ensures complete training. By ordering the content in a logical and sequential way, trainee understanding is more solidly built, thus making the learning process more effective [16].
- **Choosing Training Methods and Techniques:** The trainees will be provided with the content through different methods like lecture-based training, interactive learning, and practical activities along with some other methods that are specific to the needs of the trainees and objectives of the program. Choosing the right kinds enhances the effectiveness of training and entices trainees to get involved and be engaged. A varied number of them help in catering to different learning styles which in turn increases the probability of goal achievement [12].
- **Determining Training Activities:** Practical exercises, workshops, and simulations are very good tools drawn to reinforce and put into practice the concepts so that the employees can make use of what they have learned. These activities should be carried out since they make trainees interact directly with the material, enhance understanding, raise learning, and increase training effectiveness [18].
- **Selecting Trainers:** The success of a training program depends on who is chosen to be the trainers. Skilled and experienced trainers will ensure that the educational content provided is of top quality. Additionally, effective communication skills and an ability to engage positively with the trainees are important characteristics. Proper trainers help significantly in attaining program objectives and enhance the learning process for the attendees [14].

Development Stage.

It involves no more than turning the ideas and strategies earlier created during the design phase into actual training resources. This includes developing e-learning that is interactive to ensure engagement, creating educational videos to explain difficult concepts, and designing practical exercises that allow the trainee to implement what they have learned in both real and simulated environments.

Development stage involves preparation of tools and software at the core of the program, including identification and provisioning of equipment such as computers and projectors and selection of educational software: e-learning platforms, simulation programs. It also encompasses arranging training content logically and coherently to

aid comprehension as well as application. Further, it involves assessing the quality test and testing the effectiveness of training materials developed before large-scale production and getting feedback from the view of users to add improvements based on their judgment. The development stage aims to ready all program components for implementation and improve trainee learning [9].

Implementation Stage.

During this phase, trainees are handed down to the training program by organizing the sessions—which can be either physical or virtual—and monitoring them regarding their interactions with both trainers and trainees, and ensuring that all necessary tools for the program to run effectively are provided [9]. The phase also stresses the act of keeping open and effective lines of communication via monitoring exchanges between trainer and trainee. Trainers have to keep tabs on both individual and group progression and provide the needed assistance in case any challenges come forth during the training process. Moreover, providing that there are ample necessary tools and resources is vital for the program's success which includes modern technologies plus online platforms for virtual training, practical training materials, and educational aids. This holistic approach assists in attaining an effective and sustainable outcome of a training program [8].

Evaluation Stage.

After the program is implemented, its efficiency is evaluated through collecting feedback from trainers and trainees and considering how well the training objectives were realized. The findings of this evaluation provide recommendations for further programs to ensure the progression of the trainees according to the predefined goals [8].

According to [6], evaluating training programs involves three main aspects:

- **Evaluating the Training Program:** An assessment of whether the training goals have been met and the collection of participants' initial views related to the program from feedbacks are important. This will include how well it addresses training needs and confirms that its plans and readiness are appropriate.
- **Evaluating Trainees and Trainers:** Concentrating on the interactions of trainees with the training and its influence on their performance, alongside evaluating the effectiveness of the trainers in delivering the program. This encompasses observing the appropriateness of training techniques and the trainers' compliance with training principles.
- **Evaluating the Impact of Training and Follow-up Results:** Evaluating shifts in the behavior and performance of trainees post-program, which involves follow-up visits to their workplaces and assessing the lasting impacts of the training.

2.6 Challenges of Implementing Training Programs

The implementation of training programs often encounters a range of challenges that can affect their effectiveness and success. Some of the most prominent challenges include [2]:

- Differences in organizational structures across institutions and unclear division of responsibilities and authorities can hamper effective coordination among all parties involved.
- Lack of well-defined policies and poor planning or reliance on inaccurate data or exaggerated forecasts can affect the implementation of training programs.
- Participants' motivation can be undermined by academic pressure, additional work or other commitments, affecting their engagement in training programs.
- Insufficient budget allocation for training can prevent the delivery of high-quality training programs.
- A lack of qualified and specialized trainers can affect the quality and effectiveness of training.
- Difficulty in aligning training schedules with participants' schedules can lead to irregular attendance and reduced effectiveness.
- Training content may not be aligned with the actual needs of participants or their practical context.
- Inadequate support from senior management can impact the successful implementation of training programs.
- Some people may resist changing their methods or refuse to apply what they have learned, reducing the impact of training programs.
- A shortage of necessary learning tools and resources can make it difficult to achieve desired goals.

3 Training Reality in Saudi Arabia

The shift is happening—in the Saudi training landscape, more importantly within Vision 2030 that is aspiring to raise skills for the Saudi youth where the initiative deems both economic and social development objectives of the country place a vital role [13]. This program accentuates improvement in work and training policies, fosters creativity through educational systems with innovation, and developing curricula that reflect the needs of national development and labor market demand [20, 28–30].

Saudi Arabia is very keen to improve its training and development policies by first improving the quality of on-the-job training for the workforce. This will involve re-engineering training curricula and implanting newfangled educational programs based on the requirements of the labor market to ready Saudi youth with modern skills that can help them adjust to rapid global economic changes [11].

Vision 2030 strongly emphasizes the development of entrepreneurship through the fostering of training programs. The programs will identify, with this goal, to find new opportunities for growth for young people while improving their management and innovation skills. In doing so, the plan looks to reduce its reliance on the oil sector and cultivate a culture of strategic partnerships that will enhance productivity, create job opportunities [20].

Hence, social empowerment and sustainable development in Saudi Arabia are highly dependent on training and education. Attainment of economic development goals and enhancement of social stability can be achieved through improvements in the training programs and fostering youth skills. The effectiveness of training is influenced quite significantly by government policies and national culture that ensure its alignment with the community needs.

In the opinion of the researchers, substantial strategic reforms implemented by the Kingdom have placed the Saudi training sector on the threshold of great development. Also, from this perspective, updating training programs to meet market demands and challenges of the digital era is what the researcher perceives to be a specific commitment of the Kingdom to Vision 2030. Thusly, through new technologies and innovation, these programs play a major role in developing skills among young people with some ambitious vision to help boost competitiveness of the Kingdom.

3.1 Challenges of Implementing Training Programs in Saudi Arabia

According to a study by [17], educational institutions in Saudi Arabia face several challenges when implementing training programs, including:

- Institutions often use traditional methods such as lectures and do not adopt modern training techniques such as group discussions, case studies or role-playing, which can reduce the effectiveness of training.
- Off-site training programs can incur high costs such as travel and accommodation costs, which can be a financial burden for the institution.
- There are concerns that training programs may not be aligned with current market needs or technological developments, leading to suboptimal benefits for participants.
- Challenges in understanding modern technologies or adapting educational methods to local culture can lead to ineffective training programs.
- Challenges in balancing theoretical knowledge with practical application in the work environment can affect the actual outcomes of training.

4 Conclusion

This chapter demonstrates that the core function of training programs is the development and refinement of individual skills that contribute to higher performance of the overall organization. By studying foundations and basic concepts of training, as well as considering the principles and conditions for its success, we can clearly understand the extreme importance of designing and implementing effective training programs. Acquiring knowledge on the stages in program planning, possible implementation challenges, and specific difficulties in a Saudi context is an extremely important aspect that can increase their efficiency related to various organizational settings. The chapter found out that Saudi Arabia is gradually coming to realize how vital training programs are in improving workforce competencies resulting from increased productivity due to technological advancements; this will be achieved through ensuring public investment in order to attain those benefits for the Kingdom's strategic goals plus sustainable development.

4.1 Findings

- **Fundamentals of training program design**: The study confirmed that key fundamentals such as comprehensiveness, planning, continuity and development must be considered in training program design.
- **Success factors**: The study highlighted that the success of training programs depends on their alignment with organizational requirements, clear objectives, and empowerment of participants and evaluation of outcomes. It also emphasized the importance of adapting to cultural values, using technology and engaging international stakeholders.
- **Implementation challenges**: The study identified several challenges affecting the implementation of training programs, including resource shortages, technical challenges, resistance to change, time constraints and unclear objectives. Strategies to overcome these challenges were also presented.
- **Saudi context**: The study found that Saudi Arabia faces challenges in terms of training program design, technical issues and competency development. However, there is room for improvement through improved training strategies, updated technology and development of trainer skills.

4.2 Recommendations

- Continuously improving training strategies and addressing challenges that may impact the implementation of training programs.
- Investing in the latest educational technologies and training programs to enhance learning effectiveness.

- Continuously adapting to changes and challenges encountered during training program implementation to ensure maximum benefits and alignment with national and future goals.
- Designing training programs that are aligned with market needs and reflect the latest developments in the field.
- Strengthening collaboration between educational institutions, companies and the local community to ensure that training programs are aligned with market needs.
- Leveraging international experiences and best practices in training program design and implementation.

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Human-Technology Interaction: Exploring the Psychological Implications of AI and Automation in the Workplace



Saed Salah Alfraih

Abstract As the workplace undergoes rapid transformation due to AI and automation, conversations frequently emphasize their economic effects, often neglecting the important psychological consequences these technologies bring. This study seeks to rectify that gap by examining the intricate dynamics of human-technology interactions in professional settings, with a focus on the psychological ramifications of AI and automation. By revisiting research from the 1950s and incorporating modern studies, this chapter delivers a thorough evaluation of how these innovations affect mental health, job satisfaction, and overall well-being. The results underscore both the potential dangers and benefits associated with AI and automation, highlighting the necessity for a comprehensive understanding of their influence on employees. This research provides crucial insights that can inform future strategies and policies in the workplace, aiming to ensure that the integration of technology promotes rather than detracts from human well-being.

Keywords AI in the workplace · Automation · Human-technology interaction · Work psychology · Psychological implications

1 Introduction

Conversations surrounding the future of work frequently emphasize the economic consequences of AI and automation. Nevertheless, a recent report from Deloitte indicates that a crucial aspect of this discussion has been neglected. This report highlights that the psychological effects of these technologies represent one of the most pressing challenges in today's workplace. This chapter aims to examine that assertion by investigating the complex interplay between humans and technology in

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professional settings. By drawing on psychological studies, particularly those within the realm of 'work psychology', we seek to unravel the subtle intricacies present in human-technology interactions [1]. Given the significant impact of the COVID-19 crisis on the labor force, it is essential to consider how AI and automation might influence the future of work. Our main goal is to spark a wider conversation regarding the transformative influence of technology on our professional lives. Instead of merely concentrating on how technology might replace human workers, we suggest looking into its potential to revolutionize and enhance our work experiences. To establish the foundation for this discussion, we find it beneficial to revisit pioneering research from the 1950s that explored the psychological effects of automation in the workplace [1]. While this earlier research may lack contemporary empirical relevance, we assert that it can act as a valuable launching point to ignite dialogue and encourage conversation. To ensure a thorough analysis, we enhance these historical perspectives with more current studies that illuminate the changing psychological dynamics of human-technology interaction. By expanding our viewpoint and grasping the psychological ramifications of AI and automation, we can uncover fresh insights regarding the future of work. This inquiry allows us to assess both the potential dangers and the overlooked possibilities that emerge from the smooth incorporation of technology into our professional environments [2]. As we traverse a swiftly changing technological terrain, it is crucial to reflect on the comprehensive effects these advancements have on workers' well-being, motivation, and overall satisfaction. The psychological aspect of AI and automation indeed warrants careful scrutiny when considering the future of work. By incorporating the findings derived from psychological studies, we can foster a more sophisticated and knowledgeable dialogue regarding the transformative capabilities of technology. This broadened comprehension will prepare us to maneuver through the changing landscape of work with resilience, adaptability, and a strong dedication to human well-being.

1.1 Significance of the Study

The Industrial Revolution marked a significant transformation in the dynamics between humans and technology. As mechanization took over human labor, a growing interest in the intricate components, the technologies that powered them, and their consistent, efficient operation emerged within social and business spheres. Concurrently, the psychological effects of these technologies began to surface. Innovations such as Frederick Taylor's synchronization of worker and machine actions to boost productivity, Henry Ford's introduction of assembly lines that restricted workers from diverting their attention, and Elton Mayo's research on the influence of light, noise, rest periods, and teamwork on workers did not explicitly tackle the psychological consequences of this subservience to technology [3]. Nevertheless, it was evident that the focus of employers and engineers lay in technologies that facilitated steady, linear outputs. While production systems have evolved and the role of technology has shifted, the perspectives and interests surrounding human-technology interactions

have remained relatively stable. There have certainly been scholars voicing concerns about the ethical and social implications of creating systems that reduce error rates without offering tools to assist humans in managing their natural tendencies toward mistakes. However, it can be argued that this concern has not gained widespread attention. The emphasis is instead placed on the computers, sensors, and AI that aim to limit or completely eradicate human error. Active research and engineering are underway for AI applications in cities, security, airports, vehicles, and freight ports, with fully automated vehicles expected to emerge soon. These advancements rarely provoke public discourse regarding their psychological effects. It seems that only recently has the focus of research interest begun to shift back toward exploring the relationship between technology and human abilities/perceptions, rather than solely prioritizing errorless technologies at the expense of these capabilities.

1.2 Study Objectives

This study intends to fill the void in existing literature concerning the psychological effects of AI and automation in the workplace, concentrating on three main objectives. The first objective is to explore current psychological research related to human-technology interaction, particularly in the realm of AI and automation. The second aim involves critiquing and synthesizing significant findings to highlight essential trends and concerns that have been neglected. Finally, this research advocates for the integration of socio-technical systems theory as a framework for upcoming studies, providing a deeper insight into how these advanced technologies influence the mental health of employees in industrialized nations.

1.3 Methodology

This study employs a qualitative design to investigate the psychological effects of AI and automation within the workplace. A systematic review of existing literature on human-technology interaction is conducted through a descriptive approach, concentrating specifically on the psychological impacts of AI and automation on employees. The research seeks to reveal how mental health, job satisfaction, and overall well-being in the workplace are affected by AI and automation by analyzing various frameworks, empirical studies, and case analyses. After the literature review, an analytical method is used to synthesize the results, highlighting significant themes, trends, and implications. This methodology aims to deliver thorough insights into the psychological aspects of AI and automation, providing essential information for future strategies and policies in the workplace.

2 Foundations of Human-Technology Interaction

Technological artefacts do not exist in isolation; instead, the crucial dynamics between users of technology and its designers significantly influence how these tools are utilized and the outcomes they produce, often becoming integral to the technological system itself. The relationship between humans and technology is reciprocal and should not be viewed as a mere one-way exchange: while individuals create technology, it also shapes work patterns, and technological artefacts engage with the psychological and social characteristics of each user [4]. This two-way interaction between technology and its human users results in broader economic, social, and psychological repercussions that are closely linked to various forms of technological advancement. Such effects may encompass job shifts across different industrial sectors, modifications to the rhythm and structure of daily work, and an increased demand for specific psychological or social skills. These concepts illustrate why the implications of AI and automation—whether beneficial or detrimental—extend well beyond the mere mechanistic enhancement of productivity in the workplace.

The reason for this is that psychological abilities—and their automation—create an unseen yet essential foundation upon which all functions in offices and factories rely. From this perspective, each person acts somewhat like a lynchpin within a machine: while the gears perform the tangible tasks, the pivotal point around which they gather is irreplaceable. [4] Consequently, when technological artifacts are integrated into the workplace, they will interact with the affectivity, cognition, and articulation of the lynchpins that shape the work environment.

2.1 Definitions and Concepts

Human-technology interaction has become an increasingly prevalent topic in popular media outlets, industry discourse, and in scientific research. As technology improves, many individuals fear the loss of their jobs or worry that their skills will become obsolete. The World Economic Forum reported that AI, robotics, and technological advances will improve productivity by up to 40% by 2023 [5]. Simultaneously, it will displace 40–150 million workers. This has led to the term 'technological unemployment,' which is used to describe job loss due to technology-related advances, and 'structural unemployment,' which refers to a position being automated and made technologically obsolete. Automation, in the realm of this chapter, does not refer to full autonomy (i.e., the initiation, completion, and formulation of actions). Automation is explored as a step-by-step process in which varying degrees of control shift from humans to programmed systems, such as automated cars available today. One important divide to note is the types of abilities humans and AI share. Abdelnour-Nocera and Ali classify design as an AI-kind although, currently, many do view design as a human-cognitive ability [6]. This difference of opinion stems from an

important conundrum: is it possible to have non-conscious creativity? With no present consensus answer, this leads to the controversy over non-AI functioning.

2.2 Theoretical Frameworks

The commentary explores the psychological implications in the workplace of attitudes towards the increasing influence of AI and automation on policy and professional practices. Drawing on research conducted during a collaboration between a social sciences and applied ethics group and an artificial intelligence group on the social and ethical impacts of AI and automation on the workplace and professional practices, the perspective taken here has been strongly shaped by psychology. Compelling psychological research demonstrates that how we respond to AI and automation depends on more than how they affect us as 'rational economic actors' [6]. Here, we turn our attention to the psychological aspects, exploring how AI and automation can be troubling, and why.

Before seeking to justify a policy-related psychological explanation that implies internal inconsistency, we strongly suggest that more psychology conducted in an applied context is needed. We are, by no means, the first to suggest that AI and automation in the workplace are capable of producing a societal cognitive reality with social implications [7]. In the realm of business and the workforce, AI and automation can provoke very different cognitive and emotional responses between people. There is evidence to suggest that a fear of job obsoletion was directly related to both general attitudes towards AI and automation and attitudes towards policy measures designed to curb its spread across industries. Given these results, this chapter proposes the question: in terms of workplace cognition and associated concerns, is AI or automation any different for people than any other significant workplace change brought about by new advances in technology?

3 AI and Automation Technologies

Artificial Intelligence includes intelligent software agents and machine learning methods and plays a crucial role in numerous computer applications. Within companies, various AI-driven functions are being utilized in business operations, ranging from natural language processing (NLP) that enhances communication to services in customer support and finance [7]. Additionally, many organizations implement AI within their cybersecurity efforts, which can assess and pinpoint security incidents, including threats to information systems. Generally, automation pertains to "a set [of] technologies that change or reduce human intervention in processes and systems" [8]. We have witnessed an exciting expansion in automation techniques, fueled by advancements in other technologies such as computer-based algorithms and software that can be operated by AI technologies. This combination of AI and automation,

often termed autonomic computing, is on the rise and is gaining significant attention from researchers due to its immense popularity. This is particularly important as automation technology has the potential to disrupt the labor market, necessitating further skill development, upskilling, and even reskilling. However, there is a lack of research addressing how these changes impact psychological relationships with work, well-being, labor experiences, and workers' identities [8].

Research is frequently evaluative, as seen in studies concerning workers who have faced job losses due to automation. A common belief in the current working environment is that human labor is on the verge of being replaced by automation; however, prior forecasts have not always proven entirely accurate. While certain jobs have indeed disappeared, new opportunities have emerged. In some instances, job roles have transformed rather than vanished entirely, such as in the realm of legal advice. Additionally, certain sectors have even seen an increase in demand, including productivity, dog-walking, and childcare services. Although not the primary focus, research could benefit from insights found in the critical theory of AI, which examines the potential impacts of AI and automation on workers. Such an analysis would offer valuable perspectives for both scholars and policymakers engaged with AI, automation, and the standards of artificial narrow intelligence online [9].

3.1 Overview of AI and Automation

Distinctive traits set AI and automation apart from conventional, human-centered technology concepts. Within a business framework, AI mimics human actions such as perception—manifested through text, image, and voice recognition—thinking, and executing tasks (like robots) in place of human employees [9]. Conversely, automation refers to a system designed to carry out a series of tasks or processes independently, without the need for human involvement. In this context, AI empowers automation systems to learn from their experiences and adapt their responses based on new information. The capacity to identify patterns, analyze vast amounts of data, and provide immediate reactions positions AI and automation as formidable tools that can enhance organizational operations and processes beyond human capabilities. By efficiently handling monotonous and repetitive tasks with greater speed and dependability than humans, AI and automation drive growth in the workplace. Thus, AI and automation present unique capabilities and specialties that hold significant potential in professional environments.

AI possesses a distinctive ability to learn by utilizing algorithms and data for decision-making. These systems are designed to identify patterns and adapt their models as they encounter new information [10]. Consequently, they can enhance their processing and response strategies based on this acquired intelligence. When integrated with automation, AI systems can significantly boost both the efficiency and accuracy of automated processes. For instance, autonomous vehicles can employ AI to navigate the optimal route while functioning automatically. This brief example illustrates how AI and automation are frequently used interchangeably,

often obscured from one another, and carry profound implications for the evolution of industrial and organizational work systems when combined in the workplace.

4 Psychological Implications in the Workplace

The adoption of AI and other technological advancements in the workplace brings forth various psychological implications, raising several concerns related to the cognitive and emotional reactions elicited by this third wave of automation. Examining these potential responses within the framework of job crafting could provide valuable support for employees as they navigate the forthcoming changes initiated by AI and automation. Additionally, beyond aspects like job satisfaction and work motivation, exploring human-technology interaction in relation to individuals' well-being could also be of interest [11].

The capacity for human workers to detach from machines, concentrate on more intricate tasks, and generate new employment opportunities may be influenced by cognitive evaluations that occur in three phases of human-technology interactions. In this chapter, appraisal-dependent flow model of human-automation interaction that connects various stages of psychological activation during task performance with two primary indicators is presented: emotional valence (such as pleasure versus displeasure) and perceived challenge (ranging from effortless to demanding) [12]. Particularly, AI technologies like assistant systems, chatbots, and robots designed to aid workers appear to play a crucial role in enhancing job crafting activities. It is probable that similar mechanisms will be activated across different job environments and crafting activities, as the malleability at work hypothesis suggests that employees engage in behaviors aimed at broadening their current roles or establishing new ones. Different job crafting strategies—task crafting, relational crafting, or cognitive crafting—could encompass the characterization of employees and tasks that can be substituted by AI.

4.1 Cognitive and Emotional Responses

This commentary delves into the psychological effects of workplace attitudes regarding the growing impact of AI and automation on professional practices and policy. It draws upon findings from a research collaboration between a group focused on social sciences and applied ethics and another dedicated to artificial intelligence, examining the social and ethical ramifications of AI and automation in professional environments. The insights presented here are significantly influenced by psychological perspectives. Intriguing psychological studies reveal that our reactions to AI and automation are shaped by factors beyond our roles as 'rational economic actors.' In this discussion, we shift our focus to the psychological dimensions, investigating the unsettling nature of AI and automation and the reasons behind it [12].

Prior to attempting to rationalize a psychological explanation related to policy that suggests internal contradictions, we strongly recommend an increase in applied psychology research. We certainly are not the first to propose that AI and automation in the workplace can generate a cognitive reality within society that carries social implications [13]. Within the business sector and workforce, AI and automation can elicit markedly different emotional and cognitive reactions among individuals. Evidence indicates a direct correlation between the fear of job obsolescence and both general perceptions of AI and automation, as well as attitudes towards policy initiatives aimed at limiting its proliferation across various industries [14]. Considering these findings, this chapter raises the question: regarding workplace cognition and the concerns tied to it, does AI or automation represent a distinct change for individuals compared to other major technological advancements in the workplace?

4.2 Job Satisfaction and Well-Being

The psychological effects of AI introduction and task automation are encapsulated in job satisfaction and well-being, significantly influencing individuals' workplace experiences. The advent of labor-saving technologies certainly holds the promise of boosting job satisfaction by streamlining and simplifying tasks, thereby lessening the overall effort required from employees. As responsibilities become less strenuous, individuals gain increased opportunities for rest and rejuvenation, which positively impacts their overall well-being [15]. Furthermore, the implementation of these advanced technologies not only enhances job satisfaction but also has the potential to improve job security [16]. By automating mundane and repetitive tasks, workers can devote more attention to complex and strategic elements of their roles [17]. This shift in duties not only instills a sense of purpose in individuals but also mitigates the risk of job loss or instability [15, 18]. Consequently, job satisfaction and well-being may be further reinforced, fostering a beneficial cycle of happiness and fulfillment in the workplace [19]. Conversely, the swift pace of technological advancement can create challenges for job security, which may in turn affect both job and life satisfaction. The anxiety stemming from the fear of job loss due to the rise of automation or AI can foster a sense of uncertainty and instability [20]. This increased perception of risk may result in lower levels of job satisfaction and overall contentment in life, leading individuals to feel anxious and uneasy about their career prospects [21]. Given the complex effects that technological progress has on job satisfaction and personal well-being, it is vital for organizations to find a balance between efficiency and the needs of their workforce [16, 22]. Although adopting labor-saving technologies can certainly enhance productivity and possibly improve job satisfaction, it is also critical to acknowledge the potential adverse effects on job security and overall wellness [23]. To address these issues proactively, organizations should invest in strategies such as providing upskilling and reskilling opportunities, maintaining transparent communication regarding technology integration plans, and cultivating a supportive workplace that prioritizes employees' well-being [24]. In summary, the

integration of AI and automation in the workplace can produce various effects on job satisfaction and well-being. While it holds the promise of enhancing job satisfaction and overall wellness by minimizing effort and creating more opportunities for rest, careful management of the possible negative repercussions on job security is crucial. By implementing proactive strategies and fostering a supportive work environment, organizations can achieve a balance that maximizes the advantages of technological innovations while safeguarding the psychological health of their employees [25].

A key aspect of job satisfaction is closely tied to overall life satisfaction. Should the rise in AI and automation contribute to greater job satisfaction, it can be anticipated that consumers will advocate through trade unions and changes in labor market regulations for a postponement of the effects that enhanced productivity—resulting from a diminished need for labor in production—will have on the workforce [25]. Companies opting to downsize their workforce will encounter a higher wage and salary expense due to the compensation necessary to encourage 'surplus' employees to resign. Additionally, they risk losing numerous explicit and implicit advantages associated with long-term employees, such as a decrease in the monitoring required to ensure individual worker productivity. Furthermore, they may forfeit the knowledge and intellectual capital accumulated by the firm's seasoned workers over their years of service [26, 27].

5 Conclusion

This chapter examined the most recent interdisciplinary findings in AI and work psychology to understand the psychological effects of automation and AI on employees. While each discipline has its own unique concerns and priorities, several consistent and similar themes emerged. Many of these issues were oriented towards the community rather than focusing solely on individuals, addressing broader aspects of workers' lives and identities beyond just the technical details of their jobs. The article has illustrated that it is feasible to articulate and comprehend varying viewpoints on AI and work in a manner that effectively bridges different research styles. Consequently, it provides valuable insights into AI that can benefit scholars across various fields. In conclusion, the significant impact of technology on job transformation, work identity, and the dynamics of workplaces and organizations was highlighted. The discourse surrounding AI in the workplace is mainly conversational rather than purely technical, and discussing the implications of technology enables all stakeholders to participate in the conversation. The earlier question also presents a challenge for upcoming research: although certain studies suggest a beneficial impact on human engagement, agency, and self-expression, much of the existing research emphasizes the potential negative implications of AI for individual identity in the workplace. There is a need for further exploration and articulation of more positive narratives.

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Advanced Fire Detection Using Machine Learning



G. Komarasamy, R. Ganeshan, Ayushi Singh, Maram Y. Al-Safarini, and Ahmed Abdou

Abstract A groundbreaking initiative is reshaping fire safety by fusing advanced machine learning with cutting-edge light sensors. This innovation swiftly detects fires, transmitting vital data for rapid emergency response, reducing damage, and enhancing safety. Its proactive approach, leveraging AI for real-time analysis and predictive risk assessment, enables preemptive measures, such as automated safety protocols. By mitigating fire hazards before escalation, this system not only saves lives and property but also lowers economic impacts and fosters resilient communities. Collaboration among stakeholders ensures ongoing innovation and adaptability to emerging challenges, promising a future of enhanced fire safety through continuous technological advancements.

Keywords Collaboration · Fosters · Resilient · Technological progress

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1 Introduction

A new fire safety initiative combines machine learning and light sensors to quickly detect fires, aiding fast emergency responses and reducing damage. Using AI for real-time analysis and risk assessment allows preemptive actions like automated safety protocols. This system prevents fires from spreading, saving lives and property, and lessening economic impacts for more resilient communities. Ongoing collaboration among stakeholders drives innovation for better fire safety with evolving technology.

2 Literature Review

Technology for fire detection depends on the fire's location and nature. In this review, the application and implementation status of alarm systems, advantages of the latest technologies, as well as their limitations and shortcomings, are explained. Many fire-detecting technologies have evolved. Whether you are sleeping or busy at work, you can see the fire early to raise the alarm and respond quickly to escape the problem. Here are some reasons why you need a smoke detection system in your home or business: Smoke detectors play an important role in alerting the home and occupants of an accidental fire. Most of these smoke detectors emit a warning signal or message to alert the local fire department of an emergency. Fire detection is important for the safety of life and property. Current methods have limitations, and there is growing interest in using machine learning to improve fire detection [1]. Machine learning can improve the accuracy of fire detection, reduce false alarms, and enable real-time monitoring by analyzing multiple data sources. Pre-trained models detect fires and alert residents using audible and visual alarms, and the system automatically notifies authorities [2]. Fire extinguishers are essential tools for combating fires and discussing their potential benefits and limitations.

2.1 Emerging Technologies

Gelled extinguishing agents: These agents consist of a liquid solution thickened with a gelling agent, allowing them to cling to surfaces and provide sustained extinguishing power. Many fire-detecting technologies have evolved [3].

Water mist extinguishers: These extinguishers utilize finely atomized water droplets to extinguish fires primarily by cooling the fuel and oxygen, minimizing water damage. Research by [4] suggests their effectiveness against various fire classes while offering advantages like reduced environmental impact compared to traditional extinguishers [5]. Electrostatic fire extinguishers: These extinguishers employ electrically charged particles to neutralize the positive and negative ions in flames,

disrupting the combustion process. Studies by [5] highlight their potential for rapid fire suppression and potential application in specific environments like electrical fires [6].

Automated fire extinguishing systems: These systems integrate sensors, actuators, and extinguishing agents to automatically detect and suppress fires. Research by [6] explores the use of drones equipped with extinguishing agents for rapid response in hard-to-reach areas [7]. YOLOv4: Deep learning object detection model, originally created for blind and visually impaired [8], can be adapted to detect indoor or residential fires.

2.2 Benefits and Limitations

Advanced fire extinguishers offer several potential advantages: Improved effectiveness: Gelled agents and water mist can be more efficient against specific fire classes, while electrostatic technology might offer faster suppression. Enhanced user control: Gelled agents may provide better control of the extinguishing agent, reducing collateral damage. Environmentally friendly: Water mist extinguishers offer a more sustainable option compared to traditional extinguishers containing harmful chemicals. Automated response: Automated systems can offer faster and more efficient fire suppression, particularly in hazardous environments [9].

However, limitations also exist

Cost: Advanced extinguishers are often more expensive than traditional models, potentially hindering widespread adoption. Training: Effective use of some advanced extinguishers, like electrostatic models, might require specialized training for optimal performance. While traditional limited applications: While some technologies, like gelled agent extinguishers, remain prevalent, advancements in technology are show promise against specific fire classes, they might not be leading to the development of more efficient and versatile fire suitable for all fire types [3]. This review explores recent technical challenges: Automated systems rely on complex developments in advanced fire extinguisher technology and require proper maintenance and testing for reliable operation [10].

2.3 Future Directions

Continued research and development are crucial to address limitations and further enhance the capabilities of advanced fire extinguishers. This includes:

Cost reduction: exploring alternative materials and manufacturing processes to make advanced extinguishers more affordable.

Standardization and training: Developing standardized protocols and training methods for safe and effective use of new technologies.
Multi-purpose functionality: researching and developing extinguishers effective against a wider range of fire types.
Advanced automation: Investigating artificial intelligence integration for intelligent fire detection and targeted suppression in complex environments [11].

The use of traditional fire detection systems such as smoke detectors has many disadvantages, as they cannot detect combustion particles during a fire that can cause property damage.

Zhu et al. [12], Obstructions such as closed or partially closed doors, walls, or chimneys can impede flow. Smoke particles are cooled and flattened and may not reach the ceiling or upper walls where the detectors are located. Smoking particles escape the detector through the air outlet. Smoking particles can enter the airstream before reaching the detector. Smoke detectors on one floor of a structure cannot detect fire on another floor.

A large amount of "smoke" may not be enough to set off a smoke detector. Smoke detectors are designed to sound an alarm at various levels of smoke density. If a fire occurs in an area that does not generate these density levels, the detector will not sound the alarm. Furthermore, this leads to false and negative alarms. Therefore, when these sensors are integrated into advanced fire detection systems, fires can be detected before disaster strikes [13]. Our machine learning model detects fires based on the Convolutional Neural Network (CNN) image detection algorithm. Many layers comprise the small parts of the image. There are three training processes for the image recognition model: training data set, validation data set, and test data set.

We use supervised learning to train a model on a labeled dataset and predict the output. Then, extraction techniques are used to obtain useful features for image classification and recognition [14–16]. Image extraction techniques are useful in a variety of image processing applications. The characteristics define the behavior of the image, thus showing where it is in the storage space, classification efficiency and time consumption [16–21] (Table 1).

3 Proposed System

The system is divided into three main components as shown in Fig. 1.

1. Capturing: This component is responsible for capturing images of the area being monitored. There are three types of cameras shown in the diagram:
    a. Closed spaces: These cameras are used to monitor indoor areas.
    b. Open spaces: These cameras are used to monitor outdoor areas.
    c. Thermal imaging cameras: These cameras are used to detect heat signatures, which can be used to identify fires in low-light or smoky conditions.

Table 1 Literature Survey Findings

S. No	Title of the paper	Year of publication	Statement	Conclusion
1	A wavelet-based real-time fire detection algorithm with multi-modeling framework	Dec, 2013	Wavelet-based real-time fire detection algorithm, addressing the challenges of capturing temporal dynamics in sensor signals and discriminating between various fire types	The proposed algorithm offers early fire detection with low false alarm rates, showcasing its effectiveness in real-life scenarios
2	A computer vision based approach for detection of fire and direction control for enhanced operation of fire fighting robot	Dec, 2023	Control, automation, robotics and embedded systems	This paper showcases the reduction in false detection rate by application of correlation which extracts the non-static property of fire and x-ray film which reduces the effect of ambient sunlight
3	Design and implementation of IoT based multi degree rotating fire extinguisher system	May 2023	Comprehensive solution for detecting and extinguishing fires effectively	Rotating fire extinguisher system has explored a novel approach towards enhancing fire safety in various environments
4	Preparation and characterization of fire-extinguishing efficiency of novel gel-protein foam for liquid pool fires	January 2023	Fire-extinguishing efficiency of the gel-protein foam compared to conventional foam agents	Superior fire-extinguishing efficiency compared to traditional foam agents
5	Drone as fire extinguisher	May 2020	Integrating cutting-edge technology with traditional firefighting methods, the implementation of drone-based fire suppression systems	Water mist systems are highly effective in extinguishing various types of fires, including those involving flammable liquids, electrical equipment, and even deep-seated fires

(continued)

Table 1 (continued)

S. No	Title of the paper	Year of publication	Statement	Conclusion
6	Water mist fire suppression systems	May, 2023	Water mist fire suppression systems offer a promising solution for modern fire protection needs, boasting effectiveness, safety, and environmental benefits	The effectiveness, efficiency, and safety benefits of employing drones equipped with firefighting capabilities in extinguishing fires
7	Experimental investigation of the fire extinguishing system with a gas detonation charge for fluid acceleration	June 2018	Provide valuable insights into the practical application and potential benefits of incorporating gas-detonation charges into fire-extinguishing systems	The experimental investigation of the fire-extinguishing system utilizing a gas-detonation charge for fluid acceleration has demonstrated promising results in enhancing fire suppression capabilities
8	Artificial intelligence with wireless sensor network for fire detection	December 2020	The integration of artificial intelligence (AI) with wireless sensor networks (WSNs) for fire detection represents a promising approach to enhancing early detection and response capabilities in fire safety systems	Through the implementation of AI algorithms, such as machine learning and neural networks, in conjunction with wireless sensor networks, the study aims to enhance the accuracy and efficiency of fire detection systems
9	Novel fire extinguishing method	Nov, 2010	Through rigorous experimentation and analysis, we have demonstrated its efficacy in swiftly containing fires across various scenarios	Through a comprehensive investigation and experimentation, we have demonstrated its effectiveness in swiftly mitigating various types of fires across different settings

(continued)

Table 1 (continued)

S. No	Title of the paper	Year of publication	Statement	Conclusion
10	Automatic fire detection and notification system based on improved YOLOv4 for the blind and visually impaired	April 2022	The visually impaired persons using them run risks related to smoke and fire. In this paper, we propose a vision-based fire detection and notification system using smart glasses and deep learning models for blind and visually impaired (BVI) people	A fire detection and notification system were developed for BVI people using deep CNN models and an improved YOLOv4 object detector
11	Indoor automated fire extinguisher system using computer vision	Jan, 2022	By leveraging computer vision algorithms and hardware components, the system effectively detects and suppresses fires in real-time, thereby minimizing potential damages and ensuring the safety of occupants	Through the integration of computer vision algorithms and hardware components, this system offers a proactive approach to fire detection and suppression within indoor environments
12	Improved feature selection model for big data analytics	Jan, 2009	By integrating cutting-edge methodologies and algorithms, our model offers a robust framework for identifying and prioritizing relevant features from massive datasets, thereby enabling more accurate and efficient analysis	Through our research and experimentation, we have demonstrated the significance of selecting pertinent features in handling large-scale datasets, thereby mitigating computational complexities and enhancing predictive accuracy

(continued)

Table 1 (continued)

S. No	Title of the paper	Year of publication	Statement	Conclusion
13	Active fire detection for fire emergency management: potential and limitations for the operational use of remote sensing	July, 2005	By leveraging satellite imagery, drones, and other remote sensing tools, the study highlights the significant benefits of real-time fire detection, including faster response times and better resource allocation	Through the utilization of satellite imagery, drones, and other remote sensing tools, it is possible to detect and monitor fires in real-time, facilitating quicker response times and more effective allocation of resources during fire emergencies
14	Incorporating experts' judgment into machine learning models	October 2023	By harnessing the insights and experience of fire experts, we have developed a robust framework that enhances the accuracy and effectiveness of fire detection systems	Through a combination of machine learning algorithms and expert input, our approach offers a promising solution for early fire detection and response, ultimately contributing to the protection of lives, property, and natural resources
15	Integrated satellite system for fire detection and prioritization	November 2021	Our system offers a proactive approach to wildfire management, enabling timely detection, accurate assessment, and prioritized response	By harnessing advanced satellite technology and machine learning algorithms, our proposed system offers a proactive approach to fire management, enabling timely detection, accurate assessment, and prioritized response to wildfires

(continued)

Table 1 (continued)

S. No	Title of the paper	Year of publication	Statement	Conclusion
16	A survey on deep learning in medical image analysis	December 2017	Reviews the major deep learning concepts pertinent to medical image analysis	Deep learning algorithms, particularly convolutional networks, have become a preferred methodology for analyzing medical images

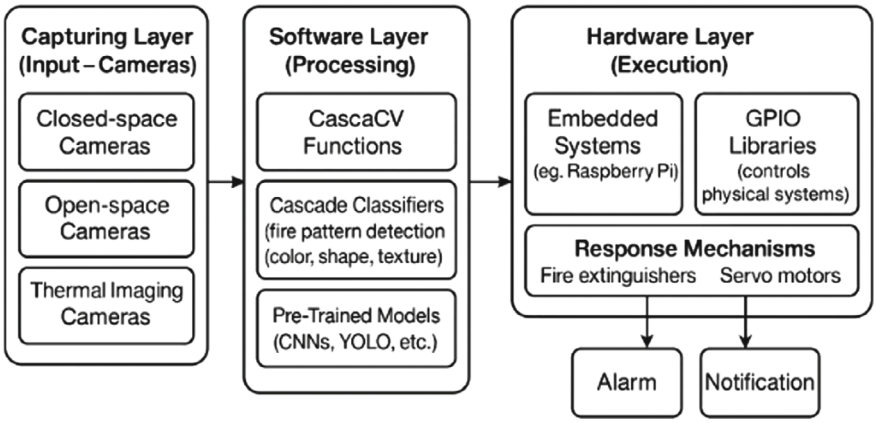


Fig. 1 Architectural diagram

2. Software: This component is responsible for processing the images captured by the cameras and making decisions about whether a fire is present. The software uses a variety of machine learning algorithms to do this, such as:

   OpenCV: This is a library of programming functions that can be used for image processing tasks such as thresholding, resizing, and feature extraction. Thresholding: Sets a brightness level. Pixels exceeding this level are marked as potentially belonging to a fire.

   Cascade Classifiers: More sophisticated approach. These algorithms are trained on a large dataset of fire and non-fire images. They identify specific patterns in the image (color, shape, texture) indicative of fire.

   Pre-Trained Models: Utilizes a pre-existing machine learning model trained specifically on fire image datasets. Offers high accuracy but may require more computational power.
3. Hardware: This component is responsible for running the software and interfacing with the physical world. The hardware includes:

a. Embedded systems: These are small, low-power computers that can run the software. Examples include microcontrollers and Raspberry Pi.
b. GPIO libraries: These are libraries that allow the software to interact with the hardware, such as controlling the fire extinguishers.
c. Response mechanisms: These are the devices that act when a fire is detected, such as fire extinguishers and servo motors.

3.1 Software Overview

In the integration of our fire detection system, the software components play a crucial role in achieving efficient and accurate results. The chosen software stack revolves around machine learning (ML) and computer vision libraries.

3.1.1 Machine Learning Libraries

For the ML aspect, we rely on TensorFlow, a versatile and powerful ML library. Its installation on the Raspberry Pi enables us to deploy and run ML models efficiently.

3.1.2 Computer Vision Library

In tandem with ML, the OpenCV library is integrated into our system to handle computer vision tasks. This includes real-time video processing, a fundamental component in our fire detection application.

3.1.3 Model Development

The development of our fire detection models is structured in three stages to progressively enhance the system's capabilities.

a. Initial Stage—Logistic Regression: In the initial stage, we implement a logistic regression-based system. This serves as a foundation for instantaneous fire detection, providing a swift response to potential fire occurrences.
b. Intermediate Stage—Neural Network with HAAR Cascade: Moving forward, we introduce a neural network-based HAAR cascade method. This approach involves training the model with a fire dataset, improving the system's ability to detect fires from provided footage.
c. Final Stage—Convolutional Neural Network (CNN): The ultimate stage involves the development of our own Convolutional Neural Network system. This sophisticated model covers deep learning methods and integrates pretrained models, as detailed in the "System Design" section.

3.1.4 Model Optimization

To ensure efficient deployment on the Raspberry Pi, we apply optimization techniques to our models. This includes quantization and size reduction, enhancing the system's resource utilization.

3.1.5 Deployment

The deployment process involves transferring the trained and optimized models to the Raspberry Pi. This enables the execution of models on the device for real-time fire detection.

3.1.6 Real-Time Processing

Real-time video processing is a critical aspect of our system. We capture video footage using the Raspberry Pi Camera Module V2, and the processing logic incorporates both TensorFlow and OpenCV. The decision-making process activates alerts promptly upon fire detection.

3.2 Hardware Overview

In the development of our fire detection system, the hardware components play a pivotal role in ensuring the reliability and efficiency of the overall solution.

3.2.1 Raspberry Pi Configuration

Our hardware centerpiece is the Raspberry Pi, a compact yet powerful computing device. The Raspberry Pi is configured with the Raspbian operating system, providing a robust foundation for our fire detection application. Network configurations are established to facilitate seamless communication, and the device is equipped with the Raspberry Pi Camera Module V2 for video capture.

3.2.2 Power Supply and Connectivity

A stable power supply is crucial for continuous operation, and our setup ensures reliable power delivery to the Raspberry Pi. Network connectivity is established through either Wi-Fi or Ethernet, depending on the specific deployment requirements.

3.2.3 Additional Hardware Integration

Beyond the core components, additional hardware elements are seamlessly integrated into the system. These include peripherals and sensors that contribute to the overall functionality of the fire detection application.

3.2.4 Testing and Validation

Throughout the hardware integration process, rigorous testing is conducted to evaluate the performance and reliability of the system. This includes assessing the response time of real-time processing, the accuracy of fire detection, and the overall stability of the hardware configuration.

3.2.5 Performance Testing

Performance metrics are gathered to quantify the effectiveness of the integrated hardware components. This involves measuring the accuracy of fire detection, the system's response time to potential fire incidents, and the overall efficiency of the hardware setup.

3.3 Hardware-Software Integration

Our fire detection system integration seamlessly brings together hardware and software components for efficient and instantaneous fire detection.

1. Hardware Integration:
    a. Raspberry Pi: configured with Raspbian, network connectivity, and Camera Module V2.
    b. Power Supply and Connectivity: Ensures stable power and network connections.
    c. Additional Hardware: peripherals and sensors thoughtfully integrated for enhanced functionality.
    d. Camera Integration: Raspberry Pi Camera Module V2 is used for capturing video footage.
2. Software Integration:
    a. Machine Learning Libraries: TensorFlow installed for model deployment.
    b. Computer Vision Library: OpenCV integrated for real-time video processing.
    c. Model Deployment: Trained models deployed to Raspberry Pi.
    d. Real-Time Processing: Utilizes TensorFlow and OpenCV for video analysis and prompt fire detection.

3. Testing and Validation:
    a. Performance Testing: Metrics gathered for accuracy and system response time.
    b. Troubleshooting: Systematic approach to address integration challenges.

Figure 2 shows the system flow diagram. This model contains a trigger such that in case of detection of fire, an alarm is set off calling out "Fire Alert," and a few seconds later, strong warning noise will start blaring. The model is fed the data for detection through the live data feed from the camera of the laptop for the time being, which can be converted to the live feed from a CCTV camera. The trigger generated on fire detection can also act as a signal for the mechanical extinguishing system, which can be relayed using the hardware planned as per the model's architecture. In a fire detection system utilizing machine learning to analyze images, the process begins with the deployment of cameras strategically placed throughout the area to be monitored. These cameras continuously capture images of the environment. The captured images are then fed into a machine learning model, which has been trained to recognize patterns indicative of fire, smoke, or flames.

4 Experimental Results

The machine learning model analyzes the images in real-time, looking for features such as color, shape, motion, and intensity. It compares these features to the patterns it has learned during the training phase. If the model detects a pattern that matches those associated with fire, it triggers an alarm.

The alarm signals are then sent to the control panel, which can activate various response mechanisms such as sounding alarms, alerting emergency services, or activating fire suppression systems. The system continuously learns and adapts over time, improving its accuracy and reducing false alarms. Additionally, it can be integrated with other sensors, such as heat and smoke detectors, to provide a comprehensive fire detection solution. Overall, a fire detection system using machine learning and image analysis provides an efficient and reliable method for early detection of fires, helping to minimize damage and ensure the safety of occupants within the monitored area, as shown in Fig. 3.

A. *Hardware Overview*

Our fire detection system relies on Raspberry Pi as the main hardware, running Raspbian OS for stability. Network configurations ensure seamless communication, and the Raspberry Pi Camera Module V2 captures video. Reliable power delivery and connectivity via Wi-Fi or Ethernet are ensured. Additional hardware like sensors enhances functionality. Rigorous testing evaluates real-time processing, fire detection accuracy, and system stability. Performance metrics measure.

B. *Hardware-Software Integration*

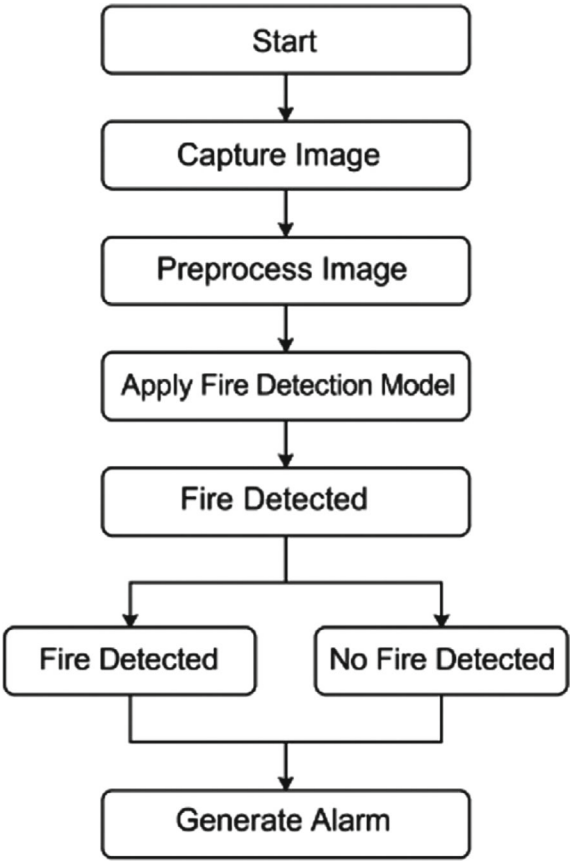


Fig. 2 System flow diagram

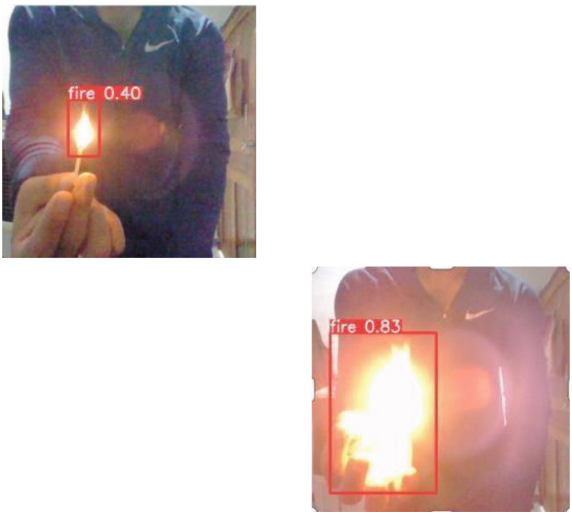


Fig. 3 Working model demonstration

We develop our fire detection models in three stages: (a) Initial Stage

- Logistic Regression: Implements a logistic regression system for swift fire detection. (b) Intermediate Stage: Neural Network with HAAR Cascade: Introduces a neural network-based HAAR cascade method, enhancing fire detection capabilities. c. Final Stage
- Convolutional Neural Network (CNN): Develops a sophisticated CNN system integrating pretrained models for deep learning. Model Optimization.

Techniques like quantization and size reduction are applied to optimize deployment on the Raspberry Pi, improving resource utilization.

The YOLOv9 model, a state-of-the-art object detection algorithm, has been successfully trained to detect fires in images. This deep learning model utilizes a single convolutional neural network (CNN) to detect and localize objects in images with remarkable speed and accuracy. In the output image generated by the YOLOv9 model, we can observe bounding boxes drawn around the detected fires, accompanied by probability scores indicating the likelihood of each detected object being a fire.

Each boundary box represents the spatial extent of the detected fire in the image. These bounding boxes are generated by the YOLOv9 model's object detection algorithm, which identifies regions in the image that contain objects matching the characteristics of fire. Alongside each bounding box, a probability score is provided, ranging from 0 to 1. This probability score indicates the confidence level of the detection. A higher probability score suggests higher confidence in the detection, while a lower score indicates lower confidence.

The YOLOv9 model is capable of detecting multiple fires in the image simultaneously. Each detected fire is represented by its bounding box and associated probability score. This allows the model to effectively identify and localize all instances of fire present in the image. The output generated by the YOLOv9 model provides a clear visual representation of the detected fires, making it easy for users to identify and respond to potential fire hazards. By quickly and accurately identifying fires in images, the YOLOv9 model can play a crucial role in fire detection and prevention efforts, helping to minimize damage and ensure the safety of individuals in the monitored area. Additionally, the model's high accuracy and efficiency make it well-suited for real-time fire detection applications, where timely intervention is critical to preventing catastrophic events.

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The Impact of Technological Advancements on Human Social Structures: An Anthropological Analysis



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Abstract This chapter examines the influence of technological advancements on human social structures from an anthropological viewpoint. Over the past twenty years, the transition to digital systems has profoundly affected human communication, societal norms, and broader cultural frameworks. Consequently, anthropologists must critically analyze these transformations to contextualize how contemporary technological trends are reshaping everyday life and ultimately influencing societal changes in the long term. A qualitative research methodology with a descriptive design is employed in this study to conduct a thorough review of literature, case studies, and historical chapters related to the intersection of technology and social orders. Additionally, an analytical approach is utilized to evaluate the effects of technological innovations on social principles, including community dynamics, family ties, and the gendered division of labor across various societies. Findings reveal that technological changes have consistently and significantly impacted human social structures in both radical and contradictory manners, highlighting the intricate relationship between technology and social norms. This chapter calls for ongoing exploration into how emerging technologies will further affect social structures and cultural systems in the future.

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Keywords Technological advancements · Social structures · Anthropology · Digital systems · Human interactions · Societal norms · Cultural systems · Gendered division of labor · Co-evolution · Techno-social processes

1 Introduction

Integrating digital technology into the essential social frameworks of human society seems to be a crucial and rational approach when considering their implications. This chapter aims to achieve precisely that. The digital systems that have emerged over the past twenty years, characterized by their vast reach and scale, are poised to significantly impact human social structures [1]. As anthropologists tasked with analyzing all forms of social organization, they are called to clarify the surrounding world, contextualizing the daily lives of individuals similar to ourselves, even if they are situated in different geographical locations [1]. Since our examination here extends beyond current occurrences to how they evolve into trends, informed by the entirety of prior developments, the importance of this subject should be unmistakable [2].

This chapter does not suggest that employing contemporary anthropology's tools to explore the social ramifications of digital networks will lead to a specific forecast [3]. Nevertheless, it is anticipated that such a subject could serve as an intriguing foundation for future research endeavors [2, 4]. Currently, it is evident that extensive studies examining how genuine social interactions evolve in conjunction with electronic systems are lacking [5]. However, as older hierarchical social frameworks give way to the more egalitarian structures created by information and communication flows, it becomes increasingly likely that the focus will shift towards fostering individual development amidst highly variable dynamics, as evidenced by both individual initiatives and the discourse surrounding networks [3, 6, 7].

Over the span of more than 100,000 years of human existence on Earth, there has been an extraordinary acceleration in technological development, ultimately transforming our world [8]. This transformation has progressively influenced human behaviors and social frameworks [9, 10]. The manner in which humans engage, live, work, and socialize with each other has been fundamentally altered by technology [4, 11, 12]. Consequently, exploring the deep interconnections between technology and broader sociocultural, sociopolitical, and socioeconomic systems presents considerable research opportunities [13, 14]. Additionally, the rapid advancements in modern technology both reflect and are influenced by the economic and political forces within a global society [4, 15, 16].

While various fields have thoroughly documented the relationship between technological progress and its effects, a detailed investigation remains to be conducted [17]. The timing, reasons, and mechanisms by which these two forces have affected one another are still largely ambiguous [5, 18, 19]. Consequently, the primary research question driving this inquiry focuses not on whether technology has impacted social structures and behaviors, but rather on the organizational patterns

or norms that may have emerged during the periods of mechanization, automation, and computerization, along with the reasons behind them. Additionally, what effects do mechanization, automation, and computerization have on human social behavior and hierarchical power dynamics? Although infrequently examined, these inquiries are filled with significant implications, addressing both corporate and anthropological perspectives on technology's role, as well as the extent to which technology has directly shaped societal organization.

1.1 Objectives

The goal of this research is to explore the anthropological effects of technological progress on human societies. We have identified an ascending trend of technological advancements that have characterized this period. The study will examine how these technologies have influenced social interactions, which are fundamentally rooted in social structures, specifically focusing on the interactions among individuals, groups, society as a whole, and between two distinct societies. In this chapter, our discussion will be narrowed to concentrate on the broader social structure of society. For the purpose of this analysis, we have delineated how various social structures have developed up to this point. The research aims to uncover the intricate ways in which human interactions have shaped the nature of social structures and how alterations in these interactions affect the functioning of these structures. Our primary intention is not to enumerate the advantages or disadvantages of technological advancements but rather to pinpoint and articulate the ways in which these developments, or their absence, have influenced us. As previously stated, all our analysis is situated within the cultural context in which these scientific advancements were embraced. The cultural context plays a crucial role in the acceptance and rejection of these elements, while access to technology—whether abundant or scarce—can fluctuate at any time. It remains vital to seek out what is fundamental and preserve it for the advancement of society. Our decision to focus on anthropology stems from its encouragement of a robust, empathetic approach among practitioners, extending beyond mere interactions with individuals.

1.2 Methodology

This research will utilize a qualitative research methodology, incorporating a descriptive approach for the literature review by examining all existing materials that explore the intersection of technology and social structures through an anthropological lens. This encompasses various ways that diverse technologies have altered human interactions, societal norms, and cultural systems—extending beyond mere case studies to include records of numerous historical events. An analytical perspective further elucidates the potential impacts on various social principles, providing critical insights

into new technological advancements. The literature examined will allow for the identification of trends, challenges, and shifts in human social behavior that arise from technological development. By merging descriptive and analytical methods, the research presents compelling arguments and innovative viewpoints on a topic that has yet to be thoroughly explored in a monographic context: the relationship between technology and society.

2 Theoretical Framework

Two primary theoretical perspectives lie at the core of resources. The first, known as technological determinism, asserts that technology serves as the predominant force in shaping both the social structures and behaviors of humans [6, 20]. It operates under the assumption that the relationship between technology and society is one-directional [21]. Additionally, this viewpoint maintains that technology functions independently of other sociostructurally influences [22]. The technological artifacts created embody a specific 'technological imperative' that can only evolve along a singular trajectory [23]. Conversely, the social constructionist perspective argues that the context in which technological systems are created often exerts a greater influence on the technological agenda than the technology itself [7, 24]. This approach contends that understanding the significance of a specific technology or its associated terminology requires awareness of certain supposedly non-technological factors that hold relevance.

This viewpoint indicates that technology cannot serve as a universal remedy applicable in every context; instead, the selection of technology is significantly shaped by financial, ecological, sociopolitical, and other pertinent factors [25]. There is a cultural bias inherent in technology [7, 26]. While proponents of technological determinism argue that technology offers solutions to all societal issues, ranging from health concerns to global political strife, social constructionism emphasizes the adverse social consequences associated with advanced technology, particularly in areas such as personalization, control, surveillance, and oppression [27, 28]. Recognizing these differing perspectives on technology carries important implications for anthropologists engaged in research related to these issues or phenomena; this examination reveals three possible sets of complexities that may arise [8, 29].

2.1 Technological Determinism Versus Social Constructionism

In anthropology, the interplay between technological progress and human social frameworks has sparked considerable theoretical discussion. Some academics advocate for technological determinism, while others support a viewpoint that leans

towards a social constructionist understanding of technology's societal impact [9, 30]. Advocates of technological determinism contend that technology operates independently, with its inherent characteristics profoundly affecting human behavior. They prioritize indicators of technological advancement, including GNP, performance metrics, production methods, and physical artifacts, over elements that reflect the intrinsic diversity of humanity.

The transformation of social life has been significantly influenced by various tools, including the pill, airplane, computer, automobile, internet, social media, and smartphone, which have created new opportunities for work and leisure [31]. In contrast, social constructionism asserts that technology should be interpreted in relation to human actions and contextualized within a cultural and historical framework [10, 32]. According to this perspective, technologies and tools arise from human needs, values, and desires, subsequently reflecting the practices, meanings, and values associated with production and consumption. Advocates of the social construction of technological systems highlight numerous instances where the technological landscape can be shaped by human intervention, ranging from fostering expected behaviors through conditioning in online spaces to hacking and programming [33]. A dichotomy between technological determinism and social constructionism suggests that only one aspect of social activity should be emphasized, sidelining others. While each viewpoint offers a distinct perspective on technology, a more integrative approach may yield greater insights [34].

Recognizing a deterministic perspective allows researchers to focus on prediction and control, whereas acknowledging the social construction element necessitates a deeper examination of the reciprocal influences that mold both technology and society [35]. In many anthropological studies, it is the real social and cultural institutions, along with their associated formative dependencies and anomalies that hold significance. The newest technological tools are viewed as being influenced by, and in turn influencing, concrete human organizations within their specific cultural and historical contexts, indicating that no single aspect should be prioritized above the others [28].

3 Historical Perspectives

The ongoing societal adoption and enactment of technologies consistently spark conversations regarding what new tools will necessitate from, ensure for, or impact their users. Instead of viewing technology as a catalyst for human cognitive progress, we argue that it has often led to the disruption and sometimes the transformation of the systems through which humans express their social nature [29, 36]. By acknowledging the continuous transformations within society, we can theorize about the emergence of new frameworks for social representation and actions. Consequently, we present the following historical viewpoints: Sumerian writing and arithmetic, agriculture and domestication, the urban revolution, mechanization alongside bureaucracy, the second urban revolution, and the digital revolution [30, 37]. Each of these

periods is characterized by a shift from specific, occasional uses to more general and routine applications of the pertinent technologies [18].

The drive for improved cognitive abilities and symbolic representation in evolution has fluctuated between advancements in philosophies regarding connectivity and disjunction. Without exploring case studies across such a vast spectrum, it is unfeasible to illustrate the potential impacts technology may have had, especially in relation to the mental burden of unnecessary activation or the enforcement of particular relevance criteria [38]. Consequently, earlier historical viewpoints place modern technological innovations within a wider framework of normative, communal, institutional, mechanical, and digital systems [31, 39]. The initial three periods prominently featured normativity, while the fourth increasingly highlighted the establishment of societal representations related to personal information concerning ownership and governance, with the digital aspect focusing on regulated and formalized reinvestment in co-creative digital information enterprises [5, 40].

3.1 Key Technological Innovations and Societal Changes

Understanding the techno-tonic shift in social organization and desirability requires examining significant technological innovations. From the perspective of a techno society, these technologies are viewed as social facts, based on the premise that distinct eras in human history can be marked by such pivotal developments [17, 32]. For instance, the industrial revolution introduced mechanization, fundamentally altering societal structures related to primary occupations, as it transitioned labor from predominantly rural agricultural work to urban factory jobs [6, 9]. A more contemporary advancement is the Internet, which facilitates immediate global communication, provides access to vast information, and fosters an increase in virtual workplaces through interconnected computers [1]. In the context of globalization, the phenomenon often referred to as the "shrinking world" hypothesis emerges, where distances appear trivial due to advancements in technology [33].

Technological advancements have undeniably transformed social structures. The impact of industrialization altered living patterns in both rural and urban areas, expanded educational access, and generated a significant need for labor forces [2]. It established clear distinctions among socioeconomic classes [10]. Additionally, the emergence of commercialism, new behavioral trends, and shifts in social and cultural norms have also been noted [3, 34]. Each significant technological breakthrough brings into question prevailing values, economic adaptability, and social conventions [7]. In recent years, the rise of the Internet—often referred to as the "information superhighway"—has provided a vast array of information, including online studies and educational offerings [8, 16]. Present-day forecasters predict that educational boundaries will become increasingly indistinct across all educational sectors, leading to the creation of businesses that offer "virtual" degrees, which grant educational acknowledgment and a place within the broader global social marketplace [11]. Such perspectives prompt the "value question": whether one form of

educational capital may hold greater value than another in the next fifty years [35]. By keeping a focus on the historical advancements in technology, this chapter will soon present the experiments related to this topic. Our aim, supported by historical evidence, is to demonstrate the value of reflecting on the past to better address the technological challenges that our societies face now and in the future [4, 36].

4 Case Studies

4.1 Social Media and Connectivity

In modern society, social media has emerged as the foremost avenue for communication and connection, significantly altering how digital media users interact, relate, and construct social frameworks [12, 37]. This inquiry also delves into the evolution of etiquette and the challenges that have surfaced within the institutions of these social applications [36]. An analysis will be conducted on specific conventions by showcasing their social benefits alongside the mistreatment and degradation that have resulted from failing to adhere to these unspoken agreements inherent in the apps [13, 38]. As we distance ourselves from conventional communication methods, interpersonal relationships evolve concurrently; there are notable disruptions in the communities formed by these platforms when the unwritten rules of twenty first-century web etiquette are disregarded or deemed unimportant [14, 39]. These platforms provide remarkable opportunities for connectivity and relationship building, from making new friends to discovering positive influences in our neighborhoods. Yet, this connectivity unfolds amid a battle against misinformation, where conflicting ideas about personal, collective, and historical origins are vigorously debated [37, 40]. As the diaspora increasingly moves away from traditional reasoning, problem-solving methods, and social structures, the rise of apps in our daily lives highlights distinctly new-world characteristics and lifestyles that cultural anthropologists must also take into account [15]. These web-based thematic topics consistently emerge in conversations about place, identity, or migration, focusing on the personal relevance of these elements [20]. The growing influence of 'social media culture' raises significant questions regarding these unpublished research findings, prompting a reevaluation of the aforementioned themes [19]. Furthermore, while such subjects may be perceived as overly discussed or clichéd within today's media landscape—given their interdisciplinary roots in criminology, anthropology, media studies, and cyber-psychology—the essential thematic issues addressed here remain largely absent from formal publications and knowledge reports [38].

4.2 Automation and Employment

Automation has largely been embraced as a strategy to enhance productivity and efficiency within organizations. However, the introduction of robots significantly adversely affects employment. Empirical evidence shows that robots lead to a reduction in employment levels, wage payments, or both [39]. Extensive data reinforce previous findings indicating that the use of automated equipment can have a positive net effect on job availability. Most job losses have been concentrated in the manufacturing sector, resulting in considerable employment repercussions. As numerous industrial roles in manufacturing have been either displaced or transitioned to mechanized processes involving large-scale production, it is evident that there is a substantial loss of jobs and a shift in the ownership of manufacturing resources. While automation, through labor-saving machinery and computer-controlled systems, is indeed removing jobs, it simultaneously generates new employment opportunities [39]. A strong and favorable statistical correlation exists between skill enhancement rates and the experience of economies that prioritize capital deepening with an emphasis on automation. This form of automation, which displaces labor but requires skilled workers, revitalizes the economy by creating high-skill job opportunities necessary for managing and maintaining advanced new work systems. The overall economic restructuring of workplaces is responsible for this long-term effect, as it renders certain technologically outdated jobs, which once demanded significant propositions and technical skills, obsolete [40]. This shift leads to an upgrading of skills for the newly established high-wage positions. Additionally, the emergence of high-capacity microwave relays and glass-fiber-based copper wire has resulted in the creation of new employment opportunities, lowered consumer prices, and spurred construction and various other activities.

5 Conclusion

A recurring theme throughout this chapter is the mutual involvement of technology and culture in the co-evolutionary processes found within various branches of anthropological thought. Our primary conclusion is that technological progress has significantly transformed human social structures, families, and communities in both profound and contradictory manners historically, and it continues to shape our lives in similar ways today. The techno-social dynamics we explored reveal that contemporary society is intricately connected with both non-Western cultures and historical examples. The relationship between technology and social norms has become particularly evident in the long-term evolution of labor divided by gender. Finally, this chapter delineates the parameters of our study by clearly stating what aspects we do not address regarding the intersection of technological advancement and social structures, while also emphasizing the importance of ongoing research to investigate the emerging effects of new technologies on social groups and structures.

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Legal Analysis of E-Commerce Stores: Definitions, Characteristics, and Challenges in Light of Global Legislation



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Abstract This chapter seeks to evaluate the legal frameworks governing e-commerce stores, with a particular emphasis on assessing their effectiveness in safeguarding consumer rights and addressing misleading advertising and illegal business practices. Employing a descriptive-analytical approach, the study outlines and analyzes the relevant laws and regulations in both countries. It scrutinizes legal documents and pertinent judicial rulings to pinpoint the strengths and weaknesses within the current legal structure. The findings reveal several gaps in existing legislation, highlighting the necessity for enhancements to keep up with the swift advancements in e-commerce. In light of this, the study offers a series of recommendations designed to strengthen the legal framework and better protect consumer rights, which include updating laws and enforcing more stringent regulatory measures.

Keywords E-commerce · E-commerce stores · Deceptive advertising · Consumer protection · Legal regulations, · Business practices · Descriptive-analytical methodology · Consumer rights

1 Introduction

Given the swift technological progress observed in recent decades, the influence of technology on different facets of life has never been more evident. One of the most significant developments is the rise of e-commerce stores, which have become

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essential to the contemporary digital economy. These online retailers have fundamentally changed how consumers engage with the marketplace and have created new opportunities for trade and shopping.

A key characteristic of e-commerce stores is their capacity to offer consumers a convenient and adaptable shopping experience, granting access to a vast array of products and services from the comfort of their homes. The extensive availability of the internet and smart devices allows customers to shop at any time and from any location, which boosts the attractiveness of e-commerce and greatly heightens consumer dependence on it.

E-commerce stores signify a major transformation in the realm of commerce, merging business management with technological innovation to provide a convenient and effective shopping experience. Utilizing cutting-edge technologies like artificial intelligence and data analytics, these stores deliver personalized services while consistently enhancing the customer experience. Additionally, these technologies empower companies to gather and evaluate data regarding consumer behavior, thereby improving their capacity to fulfill consumer needs and expectations.

While e-commerce stores provide a multitude of advantages, they also introduce a variety of legal hurdles that demand focused attention. Prominent among these challenges are concerns regarding privacy and security, as businesses must safeguard customers' personal information and payment details. Furthermore, navigating the evolving laws and regulations that oversee e-commerce across different nations can be intricate, necessitating that companies comply with stringent legal requirements to prevent disputes and maintain adherence.

The objective of this study is to conduct an extensive examination of e-commerce stores by exploring their definitions, features, and essential elements. Additionally, we will investigate the legal documents pertinent to e-commerce stores within Jordanian and Emirati law, emphasizing the application of conventional legal principles in a digital environment. This analysis aims to offer a cohesive viewpoint on tackling the legal issues that emerge in the realm of e-commerce and to propose strategies for enhancing legal frameworks associated with e-commerce stores, aligning them with market trends and modern needs.

1.1 Study Objectives

This study aims to achieve the following objectives:

1. Analyze the legal framework for e-commerce stores in Jordan and the United Arab Emirates and examine its effectiveness in regulating commercial activities and protecting consumer rights.
2. Assess the effectiveness of current laws and legal procedures in addressing issues related to deceptive advertising and unlawful business practices in e-commerce stores.

3. Analyze the legal gaps in existing laws and provide a comprehensive analysis of their impact on consumer protection.
4. Propose recommendations for improving the legal and regulatory framework to enhance consumer protection and ensure the integrity of e-commerce.

1.2 Study Methodology

The primary approach of the study employs a descriptive-analytical methodology to examine the legal regulations governing e-commerce stores in Jordan and the UAE. It starts with a thorough description of the relevant laws and regulations, emphasizing an assessment of their alignment with international standards for safeguarding consumer rights and addressing misleading advertising and illegal business practices. An analysis of legal texts and pertinent judicial rulings helps to uncover the strengths and weaknesses present in the current legal framework. By utilizing this methodology, the study seeks to offer evidence-based suggestions for enhancing the legal structure and ensuring the protection of consumer rights in the realm of e-commerce.

2 The Nature of E-Commerce Stores

An e-commerce store serves as a bridge between merchants and consumers, enabling commercial transactions that range from showcasing products and services with particular features and prices to the purchasing process itself. It has been noted that certain legislations, including those from Jordan and the UAE, have yet to define specific terms for e-commerce stores or regulate their nature and identify their components. In this context, scholars have varied in their definitions of e-commerce stores [1]. Consequently, the researchers aim to explore the concept of e-commerce stores, their characteristics and components, while also examining their legal nature in this section, making a distinction between them and websites [2].

2.1 Concept of E-Commerce Stores

Advancements in technology have allowed e-commerce stores to offer consumers the convenience of viewing, comparing, and purchasing products from the comfort of their homes, thus saving both time and effort. This section will explore the definition of e-commerce stores, their characteristics, and the physical as well as intangible elements involved [3].

Definition of E-Commerce Stores

Generally speaking, an e-commerce store is characterized as a venue for commerce. Indeed, the term "store" refers to a business entity or commercial establishment. According to Jordanian legislation, while e-commerce stores are not explicitly defined by the Jordanian legislator, commercial establishments are outlined in Article 2 of the Commercial Names Law. This article describes a "commercial establishment" as either an individual enterprise or a company. The components that constitute a store are detailed in Article 38/2 of the Jordanian Commercial Law, which states that "the store comprises a collection of both physical and intangible elements that differ based on the context, particularly—customers, name, logo, rental rights, distinguishing marks, patents, licenses, fees, models, industrial tools, commercial furniture, and goods" [4].

According to Article 36/A of the Commercial Transactions Law in UAE legislation, a commercial establishment is defined by the legislator as "a collection of tangible and intangible assets dedicated to conducting commercial activities, whether real or virtual, whether through technological mediums, modern technological means, or traditional methods." Article 37 outlines the components of a commercial establishment, which encompass physical elements like goods, equipment, machines, and tools, as well as intangible aspects such as customer communication, commercial reputation, trade name, rental rights, and rights related to industrial, literary, and artistic properties, along with licenses [5].

There is a divergence among scholars regarding the definition of e-commerce stores. One perspective describes it as "electronic capabilities accessible to all for engaging in commercial or service activities, encompassing everything from showcasing products and services on the store's website to the delivery of the product or service to the customer through Internet transactions." Another definition characterizes it as "a collection of elements that facilitate online commercial transactions," while yet another describes it as "a compilation of both physical and intangible components dedicated to conducting commerce, which can serve as a venue for legal actions like sales, mortgages, and leases." Additionally, it is defined as "a website on the World Wide Web where goods and services are presented, allowing consumers to browse, order, and purchase offerings from the store" [6].

The researchers posit that while defining e-commerce stores is not the responsibility of the legislator, the Emirati legislator has effectively established a definition that is both specific and significant for differentiating these stores from others. This comprehensive definition encompasses all varieties of stores, whether they are electronic or traditional. According to the Emirati legislator, any asset—tangible or intangible—that is utilized for trade, whether developed through traditional methods or modern technological means, qualifies as a store. Moreover, the Emirati legislator has acknowledged not only technological methods but also modern technological approaches, reflecting an awareness of and responsiveness to advancements, including e-commerce stores within the regulatory framework for stores. In contrast,

the Jordanian legislator has failed to introduce any legislative provisions that specifically pertain to e-commerce stores or their components, focusing solely on the elements of traditional stores as outlined in the Commercial Law [7].

According to the researchers, an e-commerce store is described as a platform utilized by a seller to engage in business transactions online, comprising a collection of both physical and intangible components that work together to draw in customers and provide them access to the available products and services, facilitating the electronic contracting process.

3 Components of an E-Commerce Store

An analysis of the articles referencing store elements within both Jordanian and Emirati laws reveals that these elements are presented as illustrations rather than a comprehensive enumeration. According to Article 38/2 of the Jordanian Commercial Law, "The store includes a set of physical and intangible elements that vary according to the situation, particularly—customers, name, logo, rental rights, distinguishing marks, patents, licenses, fees, models, industrial tools, commercial furniture, and goods" [8].

According to Article 37 of the UAE Commercial Transactions Law, a commercial establishment comprises the essential components required for conducting commercial activities. These components are categorized into physical elements, which include goods, equipment, machines, and tools, as well as intangible elements such as customer interaction, commercial reputation, trade name, rental rights, and rights related to industrial, literary, and artistic properties, along with necessary licenses [9].

The researchers are of the opinion that while the Jordanian legislator has not explicitly focused on e-commerce stores, the legal principles that apply to traditional stores can be modified to fit e-commerce platforms, encompassing the components that define each category. This adaptation is feasible because both store types serve the same purpose for which they were established, with the distinction being the medium of presentation. Traditional stores showcase products and goods in a tangible setting, whereas e-commerce stores offer products online [10].

3.1 Physical Elements

One could argue that the physical components of an e-commerce store closely resemble those of a conventional store, although these components might differ from one establishment to another based on specific conditions. Depending on the nature of the trade and the activities of the store owner, a store may feature all components or just a selection of them [11].

It is important to recognize that not all of these components are vital for establishing an e-commerce store. A store owner has the option to operate from home, utilizing either basic tools or minimal physical resources. Enumerating these components is challenging, as they differ from one store to another. Therefore, the physical components of an e-commerce store form the structure that is visible to consumers and the public. Experts concur that physical assets alone do not define a commercial entity; a commercial establishment can exist solely with intangible elements, without any physical components. The existence of a commercial establishment is unaffected legally; for example, an e-commerce store can be launched without requiring an office, personnel, chairs, air conditioning, or any other non-essential physical resources for e-commerce operations [12].

Goods Represented by Electronic Products

Goods, which are described as "virtual goods, or products, or services available for purchase through an e-commerce store and can be displayed to consumers via electronic catalogs," also encompass any intangible items sold online to consumers, including products, services, or ideas [12]. Traditionally, goods were viewed as the fundamental reason for a commercial store's existence. However, as the notion of a commercial establishment has evolved, these goods have transitioned into a non-essential component, despite their significance. A commercial store can operate with a minimal amount of goods, as long as the merchant possesses these goods. Additionally, these goods are regarded as movable assets meant for sale, subject to fluctuations in quantity, rendering them an unstable asset that cannot be mortgaged independently. Moreover, they may not necessarily be part of the sale of the commercial establishment itself, allowing the merchant to sell the store without including these goods [13].

The role of products within a commercial establishment is contingent upon the type of operations performed by the store. For instance, e-commerce platforms that provide services like flight reservations do not feature any physical goods. Conversely, certain online retailers that showcase products to consumers view goods as an essential component of their business. For these retailers, it is imperative that the merchandise is either present at the merchant's premises or housed in warehouses operated by specialized storage firms with which the merchant has agreements [14].

The researchers believe that on examining the texts of the laws, we find that both the Jordanian and Emirati legislators have included elements of commerce as examples but not exclusively. An online store might provide services; and therefore, the subject of a sales contract could be a service, such as booking flights or hotel accommodations. This is what the Emirati legislator referred to with the term "tasks," as mentioned in Article (37) of the Commercial Transactions Law. The Jordanian lawmaker dealt with this in the Consumer Protection Law, where a service is defined as follows: commercial service whether with or without compensation provided by any person to the consumer including the leasing of movable property.

Industrial Tools

Industrial tools are characterized as "tools designed to aid in the functioning of the store, encompassing machines, equipment, devices, and materials utilized in the manufacturing of products." This category also comprises transport vehicles employed for the movement of goods. If raw materials in factories serve the purpose of enhancing production and operation, they are classified as industrial tools [15].

The researchers observe that industrial tools are associated with the type of business activity conducted by the merchant. For example, a merchant who owns or rents a traditional store and both showcases and produces goods within that space, while also overseeing an online store to promote the physical shop, will require raw materials and essential machinery. In contrast, a merchant who runs only an e-commerce store from their home only needs a computer and internet connectivity to interact with customers [16].

Commercial Furniture

Commercial furniture refers to "furniture utilized in business settings, including desks, chairs, and cabinets, designed to enhance employee productivity and customer comfort, which encompasses air conditioning and seating" [17]. The furniture belonging to the store owner for personal use does not fall under the category of the store's furniture. In the realm of e-commerce stores, a significant benefit lies in the cost savings for merchants. Numerous e-commerce entrepreneurs run their businesses from home, eliminating the requirement for a conventional retail space and its associated furnishings. The researchers argue that this aspect is superfluous for e-commerce operations. An online store can be established without the necessity for an office or commercial furniture, as the focus is on the digital presence, enabling merchants to bypass physical furnishings and lower expenses [18].

3.2 Intangible Elements

As stated in Article (73/2) of the UAE Electronic Transactions Law, "Material elements are not deemed essential in a commercial establishment, in contrast to intangible elements, which are necessary for the existence of the commercial establishment" [19]. Intangible elements refer to the crucial components that a store cannot legally function without. Central to these elements are the customers, who form the very foundation of the store. Other components serve merely as instruments to draw in customers [20].

Electronic Customers

Electronic customers are characterized as "individuals who engage with the e-commerce store and form contracts for the goods and services provided by the merchant" [21]. Additionally, they can be referred to as "a network of connections linking the public to a commercial entity, regardless of whether these connections

are temporary or enduring." This component is essential for the existence of any e-commerce store.

At its core, the idea of a store revolves around the ability to draw in and maintain customers. All other aspects are crafted to support this vital element, which is crucial for the store's survival. In contrast to personal professions, where the connection between the client and professional is intimate and direct, e-commerce does not depend on personal ties between the store owner and the clientele. Even if customers are not acquainted with the owner, they still frequent the store and make purchases. Unlike personal professions that hinge on these relationships, a change in ownership does not impact the customer base [22].

There are emerging questions such as, are there actual customers for e-commerce stores? Is customer retention feasible, and do these stores possess the capacity to maintain their clientele? Demonstrating the presence of genuine customers in an e-commerce setting is more straightforward and precise compared to traditional retail. E-commerce platforms utilize their own analytics tools to track visitor numbers and can effectively ascertain the count of real customers [23].

Consequently, the viability of any online store, whether selling products or offering services, hinges on the amount of business it can generate. This viability is realized through strategic marketing approaches that enhance customer acquisition. Attracting customers is crucial for the survival and ongoing operation of an e-commerce store. Should this capacity diminish, the store risks becoming nonviable [24].

Additionally, a certain level of independence defines the connection between customers and the store. Should this independence be compromised, it raises questions about the very existence of the store. In this regard, the French Court of Cassation determined that patrons utilizing cafeteria services at horse racing tracks do not qualify as exclusive customers of the cafeteria, as their affiliation lies with the racing organization [25]. This scenario parallels that of e-commerce stores. The factors that draw customers to an e-commerce platform mirror those found in a traditional retail environment. Therefore, the viability and ongoing success of an e-commerce store are contingent upon its capability to attract customers independently, ensuring that their loyalty is directed exclusively towards the store itself [26].

Indeed, the primary force behind the e-commerce store is the customer, who is also one of the most vital components of business operations. The success and sustainability of the e-commerce store are significantly influenced by how frequently customers visit. As a result, it is essential for e-commerce stores to focus on fostering customer satisfaction and trust by implementing features that facilitate the sales process, ensuring transaction credibility, and upholding product quality. For example, providing after-sales services like product exchanges or addressing customer inquiries after a purchase can strengthen customer trust in the e-commerce store, aiding in the growth of the customer base and positively affecting the store's overall success [27].

Domain Name

Scholars engage in discussions regarding the definition of a domain name. Some characterize it through its technical aspects, referring to it as "specific symbols through which an Internet user can access the website they seek information from" [28]. In contrast, others focus on its electronic structure, highlighting that a domain name is composed of two components: the initial part, which is constant and represented by the segment (Http://www), and the second part, which serves as the essential segment that differentiates various projects and commercial endeavors according to their trademarks [29].

On the other hand, there are those who characterize it by its purpose, referring to it as "unique and specific addresses that, when entered by a user in the appropriate field, guide them to the site via the Internet. This address sets the website apart from all others online, and without it, no user can reach any site".

A domain name serves as "the identity card that differentiates one e-commerce store from another." It stands out as the most significant component of an e-commerce store, directly linked to its capacity to draw in customers and maintain ongoing engagement with them. As a result, no more than one store can utilize a single domain name; each e-commerce store possesses its own distinct domain name [30].

The domain name functions as the overarching structure that sets apart the electronic product, facilitating transactions across the network that encompass a range of services, goods, and products. Its role is to help customers easily identify the store, distinguishing it from others [31]. This differentiation is meant to separate the operations of the e-commerce store owner from those of other online activities. Therefore, it serves as the address for the commercial project on the Internet [21].

The use of a domain name in the context of an e-commerce store serves to indicate the store's location to customers [32]. As a distinctive element of the e-commerce platform, it has specific characteristics that dictate its management and carries financial significance, enabling its owner to transfer or dispose of it [33]. The researchers recommend selecting an appropriate domain name that is straightforward and memorable for customers, while also ensuring it is relevant to the merchant's commercial activities, thus allowing customers to access it effortlessly [34].

The Electric Logo

An electronic logo is described as "any drawing, image, or symbol linked to the store for various purposes, the primary one being to differentiate the e-commerce store or its proprietor" [21]. This logo can be viewed as a type of domain name, making it subject to analogous requirements for registration and legal safeguarding; it needs to be original, distinctive, and not already utilized by another merchant [22].

An electronic logo can take the form of letters, a name, or a geometric design, often reflecting the theme of the e-commerce business [35]. Typically, it features the domain name or its initials paired with a unique design [36]. Certain academics describe it as a sign, asserting that it ought to be creative, integrating originality and attractiveness

to draw customers to the e-commerce store. Similar to other components of the e-commerce platform, its purpose is to engage customers while fostering trust and confidence in the store [16].

Hosting Contract

The hosting contract is viewed as a contemporary, unnamed agreement due to the absence of specific regulations in Jordanian legislation. Various definitions have been proposed by scholars, including one that states it is "a contract through which services are provided, allowing the hosting provider to offer some of their electronic resources by allocating space on a hard drive" [13]. Another definition characterizes it as "a contract whereby the service provider makes some of their informational resources available to the network user by providing space on a hard drive" [15]. Additionally, it can be defined as "an agreement allowing the merchant to rent from the hosting provider an Internet-connected hard drive" [6].

According to these definitions, the hosting contract involves internet users and hosting providers as its parties. An internet user is described as "an individual who connects to a website to acquire the information they require" [3]. Meanwhile, the hosting provider is defined as "a natural or legal entity that stores and manages data and information for clients, offering all necessary technical and informational resources to access this data at any time in return for a predetermined fee" [24].

The hosting contract is defined by the researchers as "the contract concluded between a professional hosting provider and an internet user, where the provider makes a part of their informational equipment and tools available to the user" [3]. This type of contract possesses several unique characteristics that set it apart from other agreements, with the most significant being that it is finalized remotely, without the physical presence of the contracting parties, but instead via the internet [4].

From the viewpoint of the provider, the hosting agreement is regarded as a commercial contract since it involves offering hosting services by storing data on a hard drive and designating a segment of that drive to the user for a fee. The nature of the hosting contract for the internet user can be either civil or commercial, depending on the status of the contractor. For example, when the user is a merchant, such as travel agencies booking online for clients to earn a profit, the hosting contract is deemed commercial. On the other hand, if the user is not a merchant, the hosting contract is classified as a civil transaction. Thus, when a hosting provider enters into an agreement with a user engaged in civil work, the hosting contract is categorized as a mixed contract [25].

The hosting agreement is regarded as a consumer contract because it involves a consumer party. A consumer contract is characterized as one that a consumer enters into to fulfill their everyday needs and wants. As a result, the hosting provider has an increased responsibility to safeguard the more vulnerable party (the consumer) from potential exploitation. This hosting contract establishes reciprocal obligations for both parties, which includes the provider's duties to inform the user and deliver the hosting service [12].

The duty to inform requires the provider to furnish the user with all essential information, ensuring that their consent is both informed and accurate, given the

provider's greater expertise relative to the user, who is the less knowledgeable party and may lack awareness of these specifics [4]. This responsibility goes beyond the end of the contract, encompassing the need to educate the user on the operational procedures required to utilize the hosting service [11]. Furthermore, it is essential for the provider to deliver technical support to help resolve any challenges faced by the user, ensuring consistent communication to swiftly address issues and safeguard users' rights [25]. The provider is responsible for facilitating the user's access to the service and meeting their informational requirements, making them contractually accountable should they not accomplish this objective [26].

The user also has responsibilities, which include compensating for the service and collaborating with the provider. The responsibility to make payments is essential, as it facilitates the provider's fulfillment of the contract. Typically, payments for the hosting service and any supplementary services from the provider are made in advance [7]. It is vital for both the user and the provider to cooperate in order to fulfill the contract's objectives. This obligation can be viewed as a duty of care, since the user cannot ensure a specific outcome, regardless of their efforts [18]. The provider carries the burden of demonstrating a breach of this duty. If the user does not exercise the necessary care, the fault lies with the user, not the provider [29].

4 Conclusion

In summary, this research has enhanced the comprehension of the discussed issue and has helped to elucidate several associated elements. The analysis and findings offered insights and concepts that may assist in shaping policies and practices within this domain. The results highlight the necessity for ongoing research and development to attain the intended advancements. It is anticipated that this study will act as a foundation for future inquiries that aim to deliver effective and practical solutions to the challenges examined.

4.1 Findings

The study reached the following conclusions:

- There are differences in the effectiveness of the legal framework between Jordan and the UAE, with some gaps affecting the effectiveness of consumer protection.
- There is a shortage of legal procedures related to misleading advertising and illegal commercial practices, which requires the improvement of mechanisms in this area.
- There is an urgent need to update legislation and regulations to keep up with the rapid changes in the e-commerce market and address emerging challenges.

4.2 Recommendations

1. Update and develop legislation and regulations on e-commerce stores to provide better consumer protection and ensure compliance with international standards.
2. Improve legal procedures against misleading advertising and illegal commercial practices by increasing supervision, inspections and transparency.
3. Strengthen cooperation between regulatory authorities in Jordan and the UAE to exchange knowledge and experience, contributing to better law enforcement and more effective development of e-commerce regulatory policies.

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Bank Interest Rates: Exploring Legal Foundations and Digital Transformations



Yasar Alhiniti and Muhammad Nader Doshan Al-Madi

Abstract This research investigates the notion of bank interest rates along with their legal underpinnings, making a distinction between their legal definitions and terminological meanings. It establishes that bank interest rates represent the monetary compensation for utilizing borrowed funds, characterized by their monetary nature, temporal relation, and connection to bank account balances. Furthermore, it is assumed that failure to meet financial obligations results in harm. The study delves into the legal foundations of interest by scrutinizing pertinent legal documents, highlighting the differing interpretations of interest in legal contexts versus delay interest as determined by judicial decisions. Recommendations from the research emphasize the necessity for cohesive interest legislation that standardizes legal definitions, bolsters the role of regulatory agencies in price oversight, and enhances transparency alongside financial literacy to achieve a more equitable balance in banking operations. Moreover, the study advocates for the incorporation of digital tools in managing bank interest rates, such as employing digital systems for precise tracking and calculation of interest, as well as utilizing digital analytics to evaluate the effects of interest on financial stability and banking transactions.

Keywords Bank interest rates · Loans · Economic development · Banking trade system · Economic factors · Legal regulations · Financial characteristics · Legal foundation · Contractual relationship · Financing

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1 Introduction

The bank interest rate is at the center of the banking system of trade and acts as an important dimension in contracts between banks and borrowers. As a crucial element governing the activity of financing and forming the conditions for loans, bank interest rates support economic development due to the provision of necessary financial resources for such a development. Because interest rates play a major macroeconomic role, specific determinants affect them based on economic principles. The significance of these determinants is thus very important for an effective process of setting and transmitting interest rates; hence, there is much need for a detailed insight into these concepts alongside their determining factors [1].

The legislation that govern interest rates is, however, complex and scattered because different relevant provisions are included from different laws. These scattered provisions constitute the legal basis for interest rates; however, their dispersion often leads to difficulties in understanding interpretation. Therefore, the aim of this research is to provide a thorough analysis of the concept of bank interest rates and their specific characteristics that define them and to review their legal framework according to the applicable legislation as an effort to bring clarity to these provisions [2].

The analysis is split into two main parts. The first part discusses the definition and characteristics of bank interest rates, how they are set up, what influences them, and their place in the financial system. This part also reviews the different economic principles that form the basis of the determination of these rates and their impact on borrowers as well as lenders. The second section of the study shall focus on the statutory foundation regarding interest rates, according to relevant legislations. It takes into account a variety of legal texts regarding interest rates and the manner in which these laws relate to one another and whether they constitute a consistent framework for the application of interest rates within the banking sector. In probing into the legal basis concerning interest rates, it specifically endeavors to bring out any inadequacies or inconsistencies in the present legal infrastructure with recommendations for possible enhancements to ensure that interest rates are applied on a fair and transparent basis throughout the banking industry.

1.1 Study Objectives

This study aims to achieve the following objectives:

Define bank interest rates by providing linguistic and terminological definitions and explain their application according to the legislation.

Review the main features of bank interest rates, such as their nature as a monetary obligation, their relationship to time, the assumption of damages and their integration.

Analyze the legal texts on interest rates in Jordanian legislation, including civil procedure law, commercial law and banking law.

Examine how the Jordanian Court of Cassation handles interest rate cases and provide insight into the stability of legal concepts regarding interest.

Propose recommendations for improving bank interest rate regulations, including the recommendation to issue unified legislation that clearly defines interest provisions and interest rates.

1.2 Study Methodology

This study depends on a descriptive-analytical methodology concerning the research topics. The descriptive method realizes a detailed and in-depth exposition of the concepts and context related to bank interest rates: definition, features, and impact on the financial system. Its data collection and analysis try to explain how varying interest rates affect economic activities and the banking sector. The analytical part of this methodology would interpret and justify relationships between different macroeconomic variables and legislations related to interest rates, therefore contributing to making such findings more valid from evidence-based policy grounds [3].

2 The Concept of Bank Interest Rates and Their Legal Foundation

Bank interest rates are key in economic development and financing because they are the primary channel through which banks finance their activities and thus contribute to general economic growth. The legal landscape of bank interest rates is crucial for the functioning of the financial system; this research seeks to analyze the concept, characteristics, and legal regulation of bank interest rates [4]. Therefore, this chapter will be divided into three parts. The first part will focus on defining bank interest rates. It will explain what constitutes bank interest rates, how they are calculated, and their functional role in banking and financial sectors. It will also describe different types of interest rates applied by banks (fixed or variable) and how these various types of rates are used in diverse lending situations. Part two dwells on the characteristic features of bank interest rates [5]. The following is a preview of the major characteristics defining interest rates and associated levels-inflation, monetary policy, market conditions. Also explored is the impact of interest rates on borrowers and lenders with their general effect on the economy. The next subsection will deal with the description of interest rates from a legal point of view, especially in Jordan. Attention will be paid to legal provisions governing interest rates' application in Jordan, specifically designed to regulate the banking industry and protect the rights of banks as well as those of borrowers [6–9]. Any lack or insufficiency within these laws regarding challenges or ambiguities in applying them as regards setting interest rates in Jordan will be detailed

by which the researcher should have grounds required for suggesting reform efforts that could enhance more clarity and effectiveness about these regulations.

2.1 Definition of Bank Interest Rates

Interest is described as the returns derived from finances, or various resources, as well as the earnings on money over a designated time frame at a particular rate [10–14]. In the realm of law, interest is defined differently based on legal principles. It refers to any growth in capital obtained by an individual from another party as compensation for a specified duration, with the requirement to repay the capital to its rightful owner upon the conclusion of that period [15]. Additionally, it is characterized as the extra sum that the bank charges the customer or pays to the customer in accordance with legal provisions, applicable to the monetary amounts involved in any banking services offered by banks to their clients [16–18]. In this context, the bank acts as either a debtor or a creditor, and this amount is represented as a percentage of the capital, which is determined by law or through an agreement made between the parties at the time of the contract. Its validity and cessation are time-dependent, and it is owed to those who are entitled to it for the duration of capital use, regardless of whether any harm has occurred [19].

The interest rate refers to the expense incurred from borrowing money, the cost of utilizing funds, or the yield on invested capital, which represents the return on time when borrowing money in exchange for liquidity preference [20]. According to various rulings by the Jordanian Court of Cassation, legal interest has been defined, asserting that "legal interest is considered as compensation for delay and the retention of money by the debtor" [21]. The Court of Cassation has made a distinction between two categories of interest: (1) delay interest and (2) compensatory interest, as indicated in its ruling: "It is evident from the provisions of Article (167) of the Civil Procedure Law that it discusses two types of interest: compensatory and delay, which are compensation for the creditor for the delay in paying a sum of money and for the use of the money by the debtor" [22].

In a separate ruling, the Jordanian Court of Cassation regarded interest as a means of compensation, asserting: "Interest is considered a form of compensating the creditor for the damage caused by the debtor's procrastination and delay in settling the debt despite its maturity" [23]. The researcher observes that the Jordanian Court of Cassation seems to conflate the general notion of legal interest with that of delay interest based on the earlier definitions. The definitions offered by the Court of Cassation specifically relate to delay interest, which falls under the broader category of legal interest. The Court's decisions have failed to differentiate between general interest and delay interest; its characterization of interest as compensation for the delay in debt settlement specifically addresses delay interest rather than legal interest in a broader context [5, 24, 25]. Additionally, the Jordanian Court of Cassation has yet to agree on a singular definition of interest. The researcher believes it is essential to consolidate the rulings of the Court and create a coherent concept in order to

improve judicial protection for borrowers and reestablish equilibrium in contracts between borrowers and banks [4, 26, 27].

3 Characteristics of Bank Interest Rates

According to the previous discussion, interest has several characteristics, which are outlined as follows:

3.1 Interest is an Obligation to Pay a Monetary Amount Due on Borrowed Capital

Interest is first and foremost a figure of money; this feature is derived from the point that interest is paid on a principal monetary figure. Basically, interest is the price of money borrowed, accruing on an obligation to repay a specific sum of money. Because typically interest is only payable on such monetary obligations, it does by itself become a figure of money in addition to the principal [28–30]. Moreover, the interest amount is both predetermined and fixed. It is computed on a rate expressed as a percentage of the principal monetary figure for which the interest is due [30, 31]. This percentage rate is applied over a specified period which gives the total interest payable. The inflexibility of the interest rate gives the lender and the borrower a sure comprehension of what it will cost them to borrow [29]. In this way, it acts as a facilitator to planning and making decisions on their finances. Such predictability is an aspect of interest; like we noted earlier, it is one of those fundamental elements of financial agreements and economic transactions [27, 32].

3.2 Bank Interest Rates Are Time-Related

Bank interest rates are defined by their relationship with time. Interest is the outcome of a deal between the creditor (the bank) and the debtor (the loan taker) regarding money for a specific period. In case the debtor does not honor, in addition to returning the amount, their obligation entails compensating the creditor with remuneration of delay interest [33].

In a maritime loan contract, which can be a type of banking loan contract when one party is a bank, the contract document shall specify the date, agreed interest, and loan duration, with interest being calculated only from the date the items for debt arrive safely [34].

Time is also a basic element of the bank interest rates. This denotes that its effects are not only limited to stipulating the interest period start and finish date but also

presides over the computation method. Normally, the interest percentage is annually computed on the principal debt, capital, or banking loan amount [35].

3.3 Bank Interest Rates Are Based on the Assumption of Harm

In situations where financial debt obligations are unmet, the assumption of harm is invoked. This principle is established under Jordanian law as outlined in Article (167/1) of the Jordanian Civil Procedure Law. This article states that if a debtor agrees to pay a specified monetary amount by a certain date and fails to do so, they must pay interest without the creditor needing to demonstrate any harm [36]. Consequently, the legislator presumes harm due to the debtor's delay in meeting their obligation, thereby freeing the creditor from the necessity of proving any damages resulting from the debtor's late payment [37].

This principle has been affirmed by the Jordanian Court of Cassation in multiple rulings. A recent decision highlighted that "Article (167/1) of the Civil Procedure Law mandates the court to grant legal interest when a debtor has committed to paying a specified monetary amount and fails to meet the deadline, without requiring the creditor to demonstrate any damage resulting from the non-payment" [38].

3.4 Bank Interest is Characterized by the Integration Property

This indicates that the amounts in the bank account are integrated and merged with interest in accordance with the law. Consequently, interest lacks independence and cannot be asserted separately from the account payments. Rather, both the deposited sums and the accrued interest are claimed collectively as a unified entity once the account is closed. This feature is clearly observable in bank deposit accounts [39]. Through this characteristic, bank interest becomes part of the total amounts in the account, aiding in the calculation and management of payments and interest in a cohesive and unified fashion.

4 Legal Basis of Interest Rates in Jordanian Legislation

Multiple legislations in Jordan focus on the regulation of interest rates. The Jordanian Civil Code contains clear stipulations that demonstrate the adoption of Islamic law principles by the Jordanian legislator, explicitly forbidding interest and categorizing

it as usury. These regulations define interest as usury, imposing an increase without a corresponding benefit or legally acknowledged effort [40].

The texts that forbid interest and disallow its use in loan agreements [41] and sales contracts [42] have been incorporated by the Jordanian legislator. Nevertheless, it is important to take into account the stipulations of particular laws, as clearly outlined in the Civil Code itself [43].

According to Article 167 of the Jordanian Civil Procedure Law, which serves as the main reference for interest rates and their regulations [44], the detailed guidelines are outlined as follows:

- Article 167 of the Jordanian Civil Procedure Law permits the judgment of interest contrary to the provisions of the Jordanian Civil Code.
- Article 167 of the Jordanian Civil Procedure Law sets the interest rate at 9%.
- Article 167 of the Jordanian Civil Procedure Law specifies the date from which interest is calculated, starting from the date of the claim or filing the lawsuit.
- Article 167 of the Jordanian Civil Procedure Law does not require proof of damage for interest to be imposed, as it is related to compensation and indemnities.

The Jordanian legislator's assertions in the previously mentioned article have been upheld by the Jordanian Court of Cassation. In a ruling, the Court of Cassation elucidated the timing of interest judgments, stating: "… contractual interest is to be paid alongside the installment and is included with the installments owed as claimed by the appellant. The interest that applies is the legal interest specified in the statement of claim and final statements, and it accrues from the date of the claim until payment in accordance with Article 167 of the Civil Procedure Law" [45].

In a separate decision, the Court affirmed that interest applies to compensations and indemnities, stating: "Article 167/3 of the Civil Procedure Law implies that interest is owed on compensations and indemnities granted by the court to one of the involved parties. The calculation of interest begins from the date the lawsuit is filed, leading to the Court of Appeal's ruling to grant legal interest from the moment the judgment is finalized" [46].

With respect to the Jordanian Commercial Law, the legislator of Jordan has incorporated various provisions that permit interest, indicating that the overarching principle is to allow interest in commercial dealings, in contrast to civil transactions. Articles 110–113 [47] permit interest on current accounts, while Article 121 [48] of the Jordanian Commercial Law authorizes bank credit.

Considering that the provisions regarding interest have been addressed by the Jordanian legislator across various texts, the researcher believes it is more suitable and beneficial to create a comprehensive provision that defines the ruling on interest and establishes its rate. Consolidating the interest regulations into a single piece of legislation would improve legal safeguards for borrowers and prevent banks from acquiring advantageous positions over them, thereby maintaining a balanced contractual relationship between the involved parties. In addition, the organization and consolidation of interest provisions play a vital role in stabilizing interest judgments, resolving discrepancies between the Civil Code and regulations governing

commercial transactions. This approach also safeguards against banks raising interest rates indiscriminately, which could result in the exploitation of borrowers.

The authority to regulate and supervise banks in setting interest rates in alignment with the country's monetary policy is vested in the Central Bank of Jordan. This power is derived from Article 43 of the Jordanian Central Bank Law [49].

A case of judicial decisions can be illustrated by the Jordanian Court of Cassation, which declared: "According to Article 43 of the Jordanian Central Bank Law No. 23 of 1971, the Central Bank is authorized to issue directives to licensed banks and specialized lending institutions, as published in the official gazette, that establish the minimum and maximum interest rates these banks and institutions may charge on credit facilities provided to clients, without being constrained by any other laws or regulations regarding interest or profit" [16].

As outlined in Article 92(e) of the Banking Law, transactions involving banking are inherently classified as commercial transactions and fall under the stipulations of the Commercial Law. The article specifies: "All banking transactions and financial activities are considered commercial by their nature, regardless of the contractual status of the client or their dealings with the bank, whether civil or commercial. The provisions of the applicable Commercial Law apply, and such transactions may be proven by all means of evidence, and are not subject to the provisions of the Murabaha System" [17]. Consequently, the determination of the interest rate is governed not only by the stipulations of the Commercial Law but also by the oversight of the Central Bank, as previously noted, along with the regulations outlined in the Jordanian Banking Law. This was affirmed by the Jordanian Court of Cassation in ruling No. 8272/2022, which indicated that the interest rate falls under the Banking Law rather than the Jordanian Civil Code. The ruling articulated: "While Article 43 of the Banking Law does not pertain to interest, Article 92(e) of the Banking Law states that 'All banking transactions and financial activities are inherently commercial, irrespective of the client's status or their relationship with the bank, whether civil or commercial. The relevant provisions of the applicable Commercial Law are applicable, and such transactions can be substantiated by any means of evidence, and they are not governed by the Murabaha System.' Therefore, Article 640 of the Civil Code is not applicable to banking transactions, leading to the dismissal of the stated grounds for appeal" [3].

5 Conclusion

This study is of the view that banking interest represents the core element of the financial and banking system, which is extremely important for how the dynamics of financing work and drive economic development. The research undertook an in-depth exploration regarding the concept of banking interest, its nature, and the legal basis underpinning it. The chapter stressed in detail the enormous legal and regulatory challenges confronting banking interest, especially taking into consideration that technological achievements within the financial system have made a significant stride. It also

highlighted how essential it is to ensure coordination between laws on existing interest rates and those governing digital innovations. It is, therefore, necessary to achieve this coordination concerning the parties to financial transactions so that an equilibrium is struck between them. With special regard to the upcoming digital technologies that are reshaping and revolutionizing traditional banking. Advanced technological progress balances the borrower's, lender's rights and other stakeholders interests by enhancing their legal security in a more equitable and transparent financial system.

5.1 Findings

The study concluded with the following findings:

1. Interests represent the monetary amount that is due on borrowed capital and is computed as a certain percentage of the principal sum. This percentage—common referred to as the interest rate—determines the cost of borrowing and is generally applied over some time.
2. The research found that bank interest is a part not only of the amount but also of the time. This constitutes part and parcel of the financial commitments of the borrower. Moreover, banking interest is reflected as part and parcel of the amounts in bank accounts which serves to improve transparency and lucidity of financial dealings especially on deposit accounts. This helps reflect very clearly how much interest has accrued and its reflection on the overall financial position belonging to that particular account holder.
3. The study found that the Jordanian legislation is composed of a number of legal texts concerning interest regulation in various spheres, including the Civil Code, the Code of Civil Procedure, and Commercial Law. In addition to this, as far as interest rates are concerned, they are to be determined and regulated by the Central Bank of Jordan in line with the monetary policy of the country so that such rates of interest are supportive of general economic goals and stability to be maintained on a larger scale.
4. The variations in the definitions of legal interest and delay interest are what some recent judicial rulings have brought out into open, pinning down the need for a unified approach towards these legal concepts. Such variation may result in different views regarding the interpretation of law and applications of interest in various cases that come before the courts, thus impinging on the fairness and predictability of judicial outcomes.
5. Borrower protection and balance in the contract between the lender and the borrower can be better achieved by consolidating legislation on interest into one comprehensive whole. Unification will result in a simpler legal regime with more straightforward guidance for the application of interest, and ensure fairness to all parties taking part in financial transactions.

5.2 Recommendations

1. Develop a comprehensive legal text that clearly defines the provisions on bank interest and its rates, taking into account the balance between the rights of borrowers and banks.
2. The Jordanian Court of Cassation should clarify and unify the concepts of legal interest and default interest to ensure judicial stability and adequate legal protection.
3. Strengthen the role of the Central Bank in monitoring and regulating interest rates to prevent banking abuses and maintain balance in contractual relations.
4. Increase transparency in the setting of interest rates by banks, clearly explaining how they are calculated and disclosed to customers.
5. Provide educational and awareness programs for borrowers and banks on bank interest and its legal provisions to improve understanding and avoid disputes.

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Cybersecurity in Social Security Systems: Addressing the Risks of Digitalization



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Abstract The digitization of public social security systems has opened both great opportunities and severe cybersecurity risks. This chapter explores the challenge of securing information and systems against a rapidly increasing number of cyber threats given the prospects for development of biometrics, cloud computing and data analytics which would redefine the architecture of social security organizations. A qualitative description approach reviews available literature on key cybersecurity challenges arising from digitalization, through a critical analysis existing security frameworks, guidelines, and best practices from global social security organizations; it also draws an opinion regarding their effectiveness in measures while dealing with risk mitigation gaps and offering strategic recommendations for building resilience into systems. Proactive cybersecurity policies will enable social security systems protect their operations—in terms of continuity and safety for digitalized services—by not allowing any form Cyber threat to compromise its integrity subjecting many individuals' information loss.

Keywords Cybersecurity · Social security systems · Digitalization · Biometrics · Cloud computing · Data analytics · Cyber threats · Risk mitigation · Cybersecurity guidelines · System resilience

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1 Introduction

The digitalization of public social security systems is a key driver of change and is instrumental in realizing operational efficiencies and cost savings [1]. This revolution has changed the paradigm of delivering social security from a standalone system to integrate with other ecosystems to make use of the enormous benefits that are made available [1–3]. The progress that has been realized on biometrics, cloud computing, and data analytics catalyzed a drastic shift in improving our technological capabilities opening up opportunities far beyond what was considered attainable [4, 5]. As these great strides were being made, leaders from around the world's social security administrations were collaborating on producing an all-encompassing set of cybersecurity guidelines; guidelines meant not only to equip but also empower organizational decision-makers toward initiating their drive for identifying changes ushered in by digital challenges [1, 6, 7]. It would lead them onto safer greener pastures where resilience breeds strength. Realizing how vital cybersecurity is in the digital age, these guidelines shall set out a top-level cover on key principles to manage the cyber risk. In following these principles, organizations will be able to secure their sensitive data and ensure that their systems are protected against emerging cyber threats [8]. With cybercrime increasing at an alarming rate and hackers growing more sophisticated with each passing day, decision-makers need to understand the gravity of the situation and take proactive steps toward safeguarding their valuable assets [2, 9]. These guidelines are not recommendations but rather a mandatory tool for the top management body responsible for forming the organization's cybersecurity program. Through the adoption of these measures, executives are able to guide their organizations toward a more secure future, fostering trust among their stakeholders and guaranteeing the continuation of their operations [10, 11]. By following these guidelines, leaders can remain proactive in the face of the constantly changing cyber landscape, addressing risks before they arise and thereby reinforcing the groundwork of their digital transformation. The digitalization of public social security systems has indeed opened doors to remarkable advancements and opportunities [3, 12]. Yet, with such progress comes the obligation to confront the cyber risks tied to this transformation, which is critically important [13]. By adhering to the cybersecurity protocols established by international social security bodies, decision-makers can confidently navigate these unfamiliar challenges and carve out a route toward a secure and flourishing future. Let us welcome this age of digitalization wholeheartedly, equipped with knowledge and vigilance, and fully utilize the transformative potential it offers us [14, 15].

This research aims to elaborate on these principles while offering enhanced background and practical insights. Social security leaders and IT professionals should actively utilize it to raise awareness regarding what could be an escalating trend of cyber risks within the sector. Despite the growing digitalization of the public sector, there exists a scarcity of published empirical evidence. This limitation is partly attributed to the challenges associated with categorizing cyber risk attacks and making comparisons across various industries [4]. At this point, it remains unclear whether cyber threats targeting social security systems are rising at comparable rates

or if they have distinct focuses compared to other sectors. Research into cyber risk trends is also hindered by small sample sizes, a lack of publicly accessible data on actual cyber incidents, and a hesitance to disclose such information due to fears of reputational harm or loss of competitive edge. The private sector has recognized that maintaining an open, transparent, and candid conversation about cybersecurity risks is beneficial for business. In the public sector, while we cannot entirely avoid the inadvertent exposure of privacy-sensitive, population-focused data, we can strive to keep the public informed and offer guidance to assist them in safeguarding themselves [5].

1.1 Research Significance

The research is important since it examines a critical overlap between digital change and public welfare. With social security systems making a growing number of strides in technology by adopting such technologies as biometrics, cloud computing, data analytics, they are also exposed to unprecedented cyber risks. The research stresses the importance of robust cybersecurity strategies for protection of sensitive personal and financial data and the need for social security institutions to implement comprehensive cybersecurity guidelines that would enable them to mitigate threats as well as protect against cybercrime and ensure system resilience. By addressing these risks, the research contributes to a more secure and trustworthy social security environment—building confidence from policymakers to beneficiaries.

1.2 Research Methodology

The study takes a qualitative approach to unravel the emerging cybersecurity challenges within a digitized social security system. A descriptive review of the relevant literature is adopted in this research by bringing together and synthesizing all manners of pre-existing studies, academic in nature, cybersecurity frameworks, policy reports, and case studies that reveal the vulnerabilities and risks entailed by digitalization. An assessment is made on core cybersecurity issues in social security systems and an analysis conducted on the current security measures' efficacy after such a review. It also critically analyzes current patterns, trends, and best practices with respect to cyber risk reduction based on concrete cases from which generalizable conclusions can be drawn for applying potential strategies in further diminishing such risks and improving the safety of digitalized social security systems.

2 Understanding the Importance of Cybersecurity in Social Security Systems

In the current interconnected landscape, where 'digitalization' has become a prevalent term, public sector services, including social security delivery, are increasingly influenced by both the risks and benefits associated with this trend [5, 16]. National governments and various sectors exhibit a broader spectrum of responses to cybersecurity threats than in the past, showcasing notable differences in maturity, intelligence, preparation, and collaboration, largely due to significant regional disparities among nations [17, 18]. When considering the essential elements of the state that encompass basic services like civil, judicial, administrative, and social services, it is crucial to recognize the role of social security within the context of cybersecurity [19]. While the role of governments in managing social security systems is widely acknowledged, the shift from traditional manual and computerized systems to digital services has occurred for several reasons—such as unique identification, digital payments, electronic governance tools, and increased mobile phone usage—resulting in these systems facing escalating cyber threats [6, 20]. As both physical institutions and critical support systems become targets, the intertwining of socio-economic and national security issues necessitates that national policy measures address both physical and cyber vulnerabilities in a cooperative manner [21, 22]. The increasing number of cyber incidents has exposed this issue within the domain of social security [23]. To grasp the level of national readiness in the various components of social security systems, it is essential to recognize that each state bears the responsibility of addressing potential or actual cybersecurity threats occurring within its borders [24]. In our interconnected world, the complexities and demands of cybersecurity challenges have escalated significantly. The problem is how governments are going to protect their social security systems now that they are under constant emerging cyber threats, which have also become more sophisticated. The interrelated nature of these systems makes a cyber-attack in one sector lead to implications in other areas of the economy. Moreover, the digitalization of social security services has revolutionized the way these systems are steered [6, 25]. Long gone are the eras of manual recording and transaction through checks [26]. Governments have laid much weight on technology to enhance productivity, bring efficiency into different processes and improve service delivery to the citizens. But as they undergo this digital transformation, there are risks involved. The reason is that e-dependence and data warehousing create a big attraction for cybercriminals into targeting social security systems during attacks since a lot of personal information is stored within those systems [27]. In response to such actions, it calls for governments' effort in improving their cybersecurity capability if these risks are to be mitigated. This is not only implementing robust technical measures but building cybersecurity awareness and resilience within public sector staff [7, 28]. This calls for a coordinated approach that involves cooperation within and across national borders. An information-sharing intelligence pooling and joint exercises are key components in any effective cybersecurity strategy [29].

Governments must also be proactive in their reaction to cybersecurity incidents, as threats may come from both inside and outside [30]. Vigilance is equally important; governments need to be able to identify potential risks quickly enough so that they can take appropriate action on time [31]. Regular audits, assessments, and simulations help in detecting vulnerabilities and gaps of security-related information, which enables the government to act on time [8, 32]. The digitalization of social security services has opened up new possibilities for citizens (and) governments alike. But it has also brought new challenges [33]. The governments should acknowledge cybersecurity as important in protecting their social security systems and take proactive steps to enhance their defense. This way, they will be able to sustain the delivery and protection of these very important services that contribute to the welfare and privacy of their people [34].

3 Common Cybersecurity Risks in Social Security Systems

New technologies, ICT and IS like artificial intelligence and blockchain are also at the heart of the way many countries manage their social security systems and deliver services and benefits. The global impact of the COVID-19 crisis has served as a powerful catalyst for accelerating digital transformation within social security sectors—underlining both the imperativeness and positive aspects of adopting innovative digital solutions [35]. However, it is essential to bear in mind that social security systems typically process a wide variety of personal data and sensitive information, apart from effectively managing substantial financial resources. This very fact makes the use of digital tools for delivering social security services an extremely attractive prospect for sophisticated cyber threats. The dynamic nature of cybercrime means that constant adjustment and vigilance are required, as cybercriminals are quick to adapt their tactics to exploit potential vulnerabilities within social security systems that heavily rely on new technologies. With the increasing number of employees needing access to these digital systems for both personal and business purposes, the related risks have surged dramatically [35]. Additionally, the significant transition to remote work, prompted by the demands of the COVID-19 pandemic, has revealed completely new challenges and risks concerning secure access and strong data protection [36]. In view of these events, it is clear that the risks which threaten social security systems because of the paradigm shift to the digital domain can be classified and categorized under several key areas [9, 13, 23, 37]:

1. First among these is an increased level of operational risk due to the increase in user and system complexity—further compounded by inertia from legacy modernization efforts—and the common use of agile and elusive threat actors. This multi-dimensional problem calls for a holistic approach that does not only take into account the technical aspects of cybersecurity but also organizational and procedural prerequisites towards building operational resilience.

2. One should never ignore the importance of strong privacy efforts and data protection when handling large stores of sensitive data. Insufficient measures or lapses in data management may have extensive effects that reach up to levels at which overall confidentiality is compromised on social security systems. Hence, there is a need to not only use cutting-edge encryption techniques but also institute stringent access controls and apply immaculate data governance frameworks that would help in protecting the privacy of information.
3. In the realm of cybersecurity threats, there are ones of financial nature. There will always be cybercriminals willing to take advantage of any vulnerability just to compromise the security of financial transactions within social security systems. The safety and resilience—those two aspects which are so important when it comes to such financial transactions—can only be achieved if we use advanced fraud detection mechanisms as well as implement real-time monitoring systems while continuously updating and enhancing payment security protocols.
4. Coming next on our list would be those related to reputational risk because, as history has shown time after time again through various cyberattacks launched against them, organizations responsible for social security administration often find themselves under heavy public scrutiny which could result in tremendous damage being done towards their overall image and reputation. Thus it becomes essential not only to develop strong incident response plans but also get engaged proactively into efforts for public relations while fostering a culture based on principles of transparency and accountability, all this done with an aim to mitigate any potential risks stemming out from these areas.
5. Social security services need to be unbroken. An attack by cyber threats often seeks to bring about the disruption or blocking of services, and this could result in dire straits for people who rely on those very services. Therefore, stringent testing, measures of redundancy, and robust contingency should be embraced to ensure resiliency and continuity of service delivery in the event of a cyber-attack that is sophisticated.
6. Cyber-attacks can be launched against the social security system, if successful, it would have a knock-on effect on other sectors vital for society and economy. The presence of common infrastructure increases the impact of a possible failure related to cybersecurity threats which accentuates the need for actions that constitute comprehensive defense provided in a well-coordinated way involving also other than individual entities' own sectors.
7. Lastly, there is a need to address supply chain risks regarding cyber tools. To address potential vulnerabilities and guarantee the tools' and technologies' integrity when applied to social security systems, stringent vetting of suppliers plus evaluations and robust quality assurance measures are to be applied throughout the lifecycle of cyber tools.

The distinct nature of social security systems plus their vulnerabilities makes it very obvious that ensuring effective management (including resilience) for cybersecurity architecture is most important. A multifaceted approach can allow social

security systems to navigate safely through cyberspace's dynamic and treacherous journey, while maintaining public trust, privacy, and well-being.

4 Technological Solutions for Enhancing Cybersecurity in Social Security Systems

A social security organization deals with extremely delicate personal and corporate data that is invaluable. Data security is of prime importance. The data should be kept confidential, unaltered, and easily accessible when needed [37]. With the increasing number of cyber-attacks on social security organizations in recent years, it becomes mandatory for every firm to enhance their security infrastructure proactively [9, 28]. This would mean heavy investments in strong security measures including advanced encryption techniques, multi-factor authentication, and regular security audits. Only through a comprehensive approach to cybersecurity will the interests of social security institutions be protected; such steps are vital for ensuring that privacy and data integrity are maintained as well. The proper implementation of tight security measures and being vigilant about looming threats will go a long way not only in guarding against malicious attacks but also building public trust and confidence in the organization that their data is well protected [10, 29]. For social security organizations, it is imperative that they keep abreast of evolving cyber threats by updating their security mechanisms on an ongoing basis, maintaining a watchful eye on trends that are forthcoming, and also collaborating with other firms as well as cybersecurity experts so as to share information pertaining to best practices [38]. This will enable these organizations to effectively mitigate potential risks and have their data (both personal and business-related) protected in the long term.

Both social security organizations and social security members have to watchfully avoid any security lapses and zealously protect the privacy of private information. Security software has been developed, including various tools for protecting these systems. These multilayered tools include features like anti-malware that are very effective at preventing, detecting, and removing any malicious software that could bypass the perimeter defense of an organization. Also, they equally provide exploit protection to make sure that vulnerabilities are not going to be used against them—thus preventing successful breaches as well [11, 30]. Not forgetting robust ransomware protection functionalities provided by these tools in ensuring that attempts to compromise data within an organization are entirely blocked. To enhance the security policies to the best levels stringent limits must be placed on data access, giving permission only to employees who need such access to effectively carry out their duties. Furthermore, it is essential to carefully evaluate all critical organizational and technical strategies, executed with precision, to ensure the highest level of protection for the data that is continuously exchanged.

These strategies include a comprehensive range of safeguards, such as the adoption of advanced encryption protocols and the creation of secure firewalls, strategically placed to prevent unauthorized access and uphold the integrity of the data [12, 31]. By implementing such robust security measures, social security organizations can strengthen their defenses against the growing threats posed by cyber malice. At the same time, members of social security can take comfort in knowing that their private and sensitive information is being meticulously safeguarded, fostering trust and confidence in the organization tasked with protecting their personal and business data [13, 32]. Ultimately, the realization of an impenetrable barrier against cyber threats hinges on the collaborative efforts of sophisticated security software, strict access controls, and an unwavering dedication to the protection of exchanged data [37]. This steadfast dedication serves as the foundation for an organization's capacity to navigate the intricate and ever-changing realm of cybersecurity, ensuring the maintenance of trust, privacy, and the safeguarding of sensitive information in an increasingly interconnected environment [14, 33].

5 Strategies for Mitigating Cybersecurity Risks in Social Security Systems

The aim of developing national strategies should be to facilitate a proactive and coordinated approach within the social security community. These strategies emphasize the importance of addressing cyber risk and should encompass initiatives focused on prevention, resilience, and management. The cybersecurity initiatives discussed here are designed to enhance global cyber preparedness and foster a culture of security. In crafting these initiatives, the social security community has collaboratively identified pertinent frameworks and best practices to bolster the resilience of social security systems against cyber threats [38]. It is crucial to tackle cybersecurity risks and to ensure an effective cyber response throughout the operational frameworks of social security administrations, which includes both senior management and technical as well as operational teams [34]. Key elements of a cybersecurity strategy for social security systems involve safeguarding critical assets, fostering accountability and responsibility for cybersecurity actions, enhancing awareness, implementing both technical and managerial measures, strengthening coordination at national, cross-border, and international levels among public and private sectors, and maintaining situational awareness and understanding [39]. These principles apply universally to all social security systems, irrespective of their digital development and system maturity [35]. Support from social security leadership is essential for addressing these principles. Clear communication and engagement from senior executives are essential. They are pivotal in shaping a cybersecurity strategy by establishing the tone and expectations for the organization. Social security leaders should be held to this standard over time and demonstrate a commitment to cybersecurity. In addition,

strong incident response capabilities and regularly updated vulnerability assessments can do much for the overall security posture of social security systems.

Collaboration with other firms and stakeholders in the realm of cybersecurity can bring about valuable risk mitigation insights and resources. This would also enhance resilience by adopting emerging technologies through proper capacity building initiatives for social security institutions, where they can make use of advanced tools based on artificial intelligence, machine learning, and automation for early detection since cyber threats. Training programs coupled with sensitization workshops play a crucial role in building self-reliance among social security professionals on identifying and responding to cyber-related risks [35]. By cultivating an environment centered on ongoing learning and enhancement, social security agencies can consistently adjust to the shifting cyber landscape and maintain an edge over potential threats [39]. A comprehensive and multi-faceted strategy that unites people, processes, and technology is essential for effectively managing cyber risk. It is also vital to regularly assess and revise cybersecurity policies and strategies in response to the evolving threat environment. Through vigilant monitoring and evaluation of new cyber threats, social security communities can bolster their preparedness and resilience against attacks [35]. Ongoing communication and collaboration both within and between organizations can promote the exchange of threat intelligence and best practices, fostering a united front against cyber dangers. Policymakers and governments should focus on prioritizing resource allocation and supporting the establishment and execution of strong cybersecurity frameworks that cater to the unique requirements of social security systems. By nurturing a worldwide culture of cybersecurity and forming robust partnerships, social security organizations can adeptly navigate the intricate and ever-changing cyber landscape, protecting vital information and ensuring the well-being of the individuals and communities they serve [36].

6 Conclusion

The research has investigated the shift toward digital provision of social protection services as a response to the COVID-19 pandemic, highlighting associated challenges concerning information security and emphasizing the crucial topic of cybersecurity within the social security sector. Although cybersecurity is vital for the effective digital delivery of social protection services, many social security institutions frequently misinterpret its significance or downplay the inherent risks tied to their digitalization efforts. This oversight jeopardizes the services and benefits available to beneficiaries. Ultimately, this reflects a lack of understanding regarding the business model, services, risks, and potential repercussions. The report wraps up with several recommendations aimed at initiatives that bolster social protection and social security in the digital era. These initiatives should be led by individual countries and tailored to local contexts, addressing any vulnerabilities while fostering ownership and engagement in social security matters. A comprehensive cybersecurity assessment is paramount; it is essential to carefully craft a cybersecurity strategy

and vision to prevent aimless navigation and to prioritize the staff responsible for delivering these services. This endeavor transcends mere protection; it is a matter of survival, ensuring that the evolution of social security yields protection that matches its significance in the eyes of policymakers.

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The Impact of Virtual Reality on Human Perception and Cognition: A Psychological Analysis



Saed Salah Alfraih

Abstract Recent developments in virtual reality (VR) technology have established it as a significant transformative force across multiple fields, potentially matching the influence of computer games within the next ten years. This paper explores the psychological effects of VR on human perception and cognition. Utilizing a qualitative approach that includes a descriptive review of relevant literature and an analytical interpretation of findings, the study examines the ways in which VR affects cognitive processes, self-identity, and social identity. Insights from psychological research are synthesized to comprehend how VR impacts emotions, beliefs, and behaviors, emphasizing the distinctive experiential medium that VR offers. The purpose of this review is to deliver a thorough analysis of the psychological outcomes associated with VR, suggest theoretical frameworks for understanding its effects, and pinpoint areas that require further investigation. The results enhance our comprehension of how immersive technologies influence human cognition and perception, providing valuable insights for the creation of effective VR applications and guiding future psychological studies.

Keywords Virtual Reality (VR) · Human perception · Cognitive psychology · VR applications · Immersive technologies

1 Introduction

In recent years, the field of virtual reality has experienced extraordinary advancements. With the rapid pace of technological development, it is conceivable that virtual reality could become as ubiquitous as computer games within the next ten years. Currently, we already have ‘avatars’ or agents integrated into our email systems.

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Numerous individuals frequently dedicate their time to engaging in computer games, which can be captivating and time-consuming. Every player can confirm that Dungeons and Dragons exemplifies a player-centric experience and, in my view, serves as a clear acknowledgment of the relationship between agent and avatar [1]. This chapter aims to explore the significance of mental research findings for the virtual reality community and vice versa, particularly emphasizing the expanding literature on the roles of the self—whether 'minimal' or otherwise—in both domains.

Certain research will be recognizable to both psychologists and analysts in virtual reality, focusing on the capabilities of perceptual and cognitive systems that constitute the self, including sequence perception, face psychology, and language. Another segment of studies will hold significance for psychologists who are interested in the SE patient demographic [1]. The remainder of the research highlights elements of the self that are essential to our social existence, such as agency, responsibility, and identity, illustrating how the interplay between these two fields can illuminate one another. Additionally, I will explore studies related to the functions of selves that are more efficient or immunological in nature, which are likely to gain importance in contexts involving the participation of multiple religious and artificial agents [2].

1.1 Research Significance

The investigation into how virtual reality (VR) affects human perception and cognition holds immense importance as it explores the complex interplay between swiftly evolving VR technologies and the human psyche. With VR set to become as commonplace as computer games in the coming decade, grasping its psychological ramifications is essential. This study seeks to connect the domains of psychology and virtual reality, illuminating the ways in which VR impacts cognitive processes, self-image, and social identity. By examining these connections, the research offers valuable insights that may enhance the creation of more immersive and psychologically beneficial VR experiences, with possible applications extending to mental health therapies and educational resources. As VR increasingly becomes part of everyday life, the outcomes of this research will be vital in steering both technological advancements and mental well-being.

1.2 Methodology

This study employs a qualitative methodology to investigate the effects of virtual reality (VR) on human cognition and perception through a psychological lens. By utilizing a descriptive approach, the research meticulously reviews and synthesizes existing literature at the intersection of VR technology and psychological processes. This descriptive method facilitates an in-depth exploration of how VR impacts cognitive functions, self-perception, and social identity. After conducting the literature

review, an analytical approach is applied to interpret and integrate the findings, highlighting significant themes and trends. This strategy fosters a deeper comprehension of the psychological ramifications of VR, offering valuable insights into the influence of immersive technologies on human cognition and perception. The findings from this study will aid in the creation of more effective VR applications and guide future psychological research in this swiftly advancing domain.

2 Understanding Virtual Reality

To fully grasp the impact of virtual reality on human perception and cognition, it is essential to clarify its fundamental concepts. Virtual reality consists of a collection of three-dimensional virtual worlds that users can navigate and manipulate, typically through various tools. It manifests as a computer-based application that utilizes proprietary data and operates with one or more devices, such as HMDs, CAVEs, wrist trackers, or props [2]. There are three distinct categories of virtual reality: immersive VR, desktop virtual reality, and non-immersive VR. Among these, immersive VR is the most potent and has the greatest influence on human perception and cognition. In this scenario, users experience the sensation of being enveloped in an environment that completely surrounds them, effectively immersing them in a virtual realm [3]. Conversely, non-immersive VR offers the least sense of immersion, relying on a computer screen to display the virtual environment. Desktop virtual reality utilizes a sizable computer monitor and offers a level of immersion that surpasses that of nonimmersive VR. The realm of virtual reality is primarily shaped by three types of computer-based environments: immersive, nonimmersive, and desktop VR. This article will concentrate on the three immersive platforms as its main subject [3].

Immersive VR utilizes a specialized head-mounted display (HMD) that completely shuts out the physical world, fully immersing the user in a virtual environment. In contrast, nonimmersive VR relies on a back-projected screen that serves as a two-dimensional monitor to present the VR setting, which can be either automatically or manually linked to the user's head position. The environment is rendered in three dimensions on this screen, with the potential to reflect specific head movements. By employing head sensors, the displayed image can continuously adjust according to the user's head orientation. Common examples of nonimmersive system head trackers include the CyberEdge Tracker, CyberSphere, Myotronix, and TrackerD, which allow the display to shift in alignment with the user's movements [4]. Users can interact with nonimmersive virtual environments either by manipulating a joystick or by turning their heads, meaning they can navigate the environment through their body position and orientation.

The hardware represents the first component, comprising the physical devices essential for crafting the virtual reality experience. This includes the display unit or headset, input devices like gloves or controllers, along with any supplementary sensors or tracking technologies [4]. The second component is the software, which includes the programs and algorithms that facilitate the virtual reality environment.

This encompasses the rendering of interactive 3D graphics, the processing of user sensory input, and the simulation of diverse virtual interactions and scenarios. The third component is the content, referring to the digital experiences and assets that users can engage with in virtual reality. This can vary from immersive simulations and games to educational applications, artistic experiences, and social interactions within virtual worlds. Lastly, the fourth component involves the user, whose role is vital in the virtual reality system. Users actively shape and participate in the virtual environment through their movements, actions, and decisions [5]. Their interactions and sensory inputs are tracked and processed to foster a sense of immersion and presence. For a genuinely immersive virtual reality experience, the seamless collaboration of these four components is essential. High-quality visuals, precise tracking, and responsive input should be delivered by the hardware. The software must be fine-tuned for seamless performance, lifelike graphics, and intuitive interactions. Content ought to be captivating, varied, and customized to meet different interests and requirements. Users should experience a sense of immersion and empowerment, exploring and interacting within the virtual realm as if it were tangible. Virtual reality holds the potential to transform numerous industries and sectors, such as gaming, entertainment, education, healthcare, architecture, and more. Its applications are extensive, encompassing training simulations for healthcare professionals, virtual explorations of historical sites, immersive storytelling, and therapeutic approaches for mental health. In summary, virtual reality is a formidable technology that allows users to engage with and navigate simulated environments through multimodal displays and sensory interpretation systems. By merging cutting-edge hardware, advanced software, engaging content, and proactive user involvement, virtual reality paves the way for new opportunities in entertainment, education, communication, and beyond [5].

The discussion revolves around sensory substitution via techniques involving reduced form audiovisual displays or immersive telepresence. Virtual reality (VR) serves as an exceptional translation tool by enabling the simultaneous construction of dual logic images, which can be generated through visualization systems (simulating an alternate personality, presence, or surrogate) or by activating displaced images (showcasing a displaced space) [2]. In computer programming, it is common to utilize only the alternate perspective (presence) that is separated. Consequently, this article will explore emerging technologies in personal computing VR, focusing on multimodal human–computer perception displays and their brief psychological impacts on the sensorium. The discussion will then shift into critical methodology [2].

From a psychological perspective, virtual reality systems hold interest primarily due to their ability to deliver perceptual experiences that significantly contrast with those encountered in daily life or when viewing a conventional screen. To evaluate the potential of any VR system in this context, it is essential to identify both the qualitative and quantitative differences between real-world experiences and those offered by various existing systems. Fundamentally, VR systems can be classified into two principal categories: those that offer a type of DS or MC, and those that deliver IS or IC [6].

The first category encompasses Earthquake Shelters, designed to generate haptic sensations mimicking earthquakes for standard educational applications; motion platforms equipped with screens or various DS devices, including commercial flight and racing simulators; advanced types of HMCS (Head-Mounted Cockpit Simulation), mainly utilized for testing aircraft helmets under different conditions or for training fighter pilots; extensive systems that replicate real-world environments for training purposes; and 3D cave systems, where participants don 3D glasses and navigate a compact virtual space, with each wall serving as a large screen, allowing multiple users to traverse and interact within an enclosed, expansive virtual setting [7]. While these systems have the potential to evoke both MC and DS, they are still classified as DS systems due to their virtual-reality components.

3 Human Perception and Cognition

Undeniably, the fundamental concepts of this field, combined with advancements in technology like virtual reality, create a remarkable narrative for a comic book. Literature highlights the intricate and contradictory relationship between perception and knowledge of the world, serving as an early alert that perception is neither a straightforward reflection of reality nor merely a distorted impression. For instance, it was noted that the image received by the retina provides limited information about natural conditions, emphasizing that the constructed act of perception frequently surpasses sensory input, and the more one understands a topic, the more one perceives [8]. It was also articulated the roles of native linguistic abilities and innate visual systems in shaping perception.

The fields of perception and action are now widely acknowledged as "cognitive" medicine and are thoroughly covered in academic textbooks. We now turn our attention to the scholars involved in the Vectors of Memories Project and their critical viewpoint on human perception and cognition [9]. This group comprises an anthropologist, a philosopher, a robotics engineer, and a neuropsychologist, all of whom possess extensive expertise in cognitive science theories, tools, and methodologies. Their aim is to work together on a foundational document that organizes and outlines the most recent insights in cognitive sciences, culminating in a series of papers that highlight and explore essential interdisciplinary topics, while also engaging in discussions surrounding significant psychological philosophies categorized under "perception," "representation," and "dynamics" [10]. It is essential to clarify what is at stake in this endeavor and the challenges involved.

3.1 Basic Principles

Our understanding progresses through the recognition of new phenomena, allowing us to visualize and conceptualize representations that have not previously been

observed with such intricate detail. Up to this point, scientists have engaged with the tangible world within an empirical framework. Humans are familiar with the reality presented through direct sensory experiences or representations, which are inherently influenced by environmental limitations. It is important to highlight that perception encompasses both the examination of entities that exist externally in the world (distal perception) and the assessment of the human organism itself (proximal perception). Processes such as selection through attention, organization, structuring, and interpretation, application of knowledge and meaning in daily life, and forecasting future events are all part of how information that has already filtered through the perceptual lens enters the realm of cognitive analysis [11].

The concept of reality originates from the term "res," which means object. An object is defined as something that exists independently. The suffix "ality" comes from the Latin word "alit," which translates to "likeness, nature, form, manner, mode of being" [12]. In this chapter, "virtual" cannot be interpreted as an alternative reality or as a mere representation of reality; it must be understood strictly in an adjectival sense and a priori. The term "reality" emerged in medieval scholastic dialectics through its composite nature, specifically when two universals are combined. Etymologically, "Örindigkeita" in ontology asserts a key distinction between non-remote and remote beings (distal) on one side, and remote non-beings and beings on the other [13]. This distinction renders the relationship between the real and the virtual as irreducible. To delineate the real from the virtual, it is essential to take perception into account. The real extends beyond perception, while the virtual encompasses it, with cognition facilitating this understanding. While perceptions may be ambiguous, conceptions, in contrast, are clear and unequivocal.

3.2 Theories and Models

To begin unraveling the fundamental elements that shape human perception and cognition in their entirety, we must first revisit the psychological theories and scientific models that provide the foundation for a thorough, varied, and insightful exploration. Over time, it has become evident that different theories attract various researchers for distinct reasons [13]. Nevertheless, the overarching goal remains unchanged: to attain a comprehensive understanding of our identity. At the core of everything we are, everything we experience, and the interactions between the two, lies human perception and cognition. A grasp of psychology is essential for investigating these aspects in the context of virtual reality.

Human behavior, in relation to action, is defined by the consequential relational effects among our beliefs, desires, reality, its representation, and the surrounding environment. This interconnectedness of these elements was initially proposed by [14], who differentiated between how we visually perceive the world and how we interact with it. Consequently, these factors extend to human capabilities, which are inherently active. Supporting arguments for humanity's efforts to present both the world and reality bolster Masin's (2006) perspective on bonding, alongside Gómez's

(2008) interdisciplinary examination of such phenomena [15]. Alternatively, the exploration of personal narratives within living conditions could be extensively analyzed through the lenses of analytic philosophy and philosophy of mind [15]. The connection between visual perception and sensory modulation has become a fascinating area of research, especially with the rise of virtual reality, simulations, and simulators. In the realm of virtual reality, alterations in visual reality are experienced through optical and visual realism, creating an environment of physical and optical spaces that initiates a process of spatial decision-making.

4 Psychological Effects of Virtual Reality

Humans have the ability to go beyond their daily existence and engage with new environments and situations through virtual reality. This immersive experience, which can simulate a sense of presence, has the potential to affect emotional states, behaviors, and cognitive processes. In this section, we will explore the psychological impacts of virtual reality experiences [17]. Our focus will include examining emotional reactions and the extent of presence felt, the heightened cognitive load required for engaging with virtual reality, the virtual reality placebo effect, and the potential long-term consequences of extended use. Additionally, we will look at individual differences in relation to virtual reality, as well as the factors influencing acceptance, rejection, and resistance to virtual reality experiences. We will also present some practical applications and conclusions regarding the subject matter discussed.

Research indicates that emotional responses elicited by virtual environments are significantly more intense than those generated by traditional screens, creating an experience that is both deeply immersive and captivating for users. In the context of virtual reality, individuals find themselves in a state of heightened presence, where their feelings are greatly affected. Interestingly, however, extensive studies reveal that there are no significant long-term emotional or psychophysiological consequences stemming from a virtual reality experience [17]. To delve deeper into the emotional engagement offered by virtual reality, it is crucial to enhance the information delivered through virtual animations. By intentionally augmenting the richness and complexity of these simulated settings, emotions can be artfully and convincingly generated, ultimately expanding the cognitive load necessary for engaging with virtual reality. These technological advancements not only enrich media studies by fostering highly immersive experiences but also present opportunities for the creation of placebo effects [18]. Drawing from the invaluable knowledge obtained through earlier studies, it becomes clear that many researchers and a significant number of studies have embraced these novel forms of human–computer interaction without adequately assessing their usability for long-term applications in health, security, and robotics. Nevertheless, it is vital to recognize the considerable need for a comprehensive examination of the possible negative consequences associated with virtual reality applications, especially regarding their effects on long-term perceptual-cognitive functions. The rapidly growing domain of virtual reality offers tremendous potential

for groundbreaking experiences and unparalleled advancements. As we explore the opportunities this technology provides, it is imperative to develop and implement it with a discerning and critical perspective, ensuring a thorough understanding of its long-term implications for individuals and society, while responsibly addressing them. Only through meticulous and systematic research can we effectively tap into the promise of virtual reality while minimizing any risks it may entail.

4.1 Emotional Responses

The emotional aspects of virtual reality experiences have been explored through various research frameworks. For instance, a study investigating the emotions triggered by virtual environments utilized a diverse array of feelings, encompassing both approach and avoidance emotions, to gain a more comprehensive understanding of how differing emotional valences influence experiences. Despite the simplicity of the virtual environments due to methodological limitations, the findings revealed that, similar to real-world scenarios, these environments could elicit intense feelings such as fear, anger, and disgust, alongside more positive emotions like happiness and amusement. An empirical analysis of emotional responses to virtual reality simulations was conducted in the context of social interactions [19]. In particular, researchers contrasted the emotional experiences of participants engaged in face-to-face interactions with those participating in the same interactions through a virtual reality simulation, where the nature of the interactions was altered.

The study indicated that, in accordance with presence theory and considering the presence or absence of virtual reality, females exhibited a heightened level of social anxiety in the virtual setting compared to face-to-face interactions. One prevalent issue faced by participants in virtual reality is cybersickness [19]. To explore the sensitivity of eye gaze, task load, task performance, and reported discomfort in relation to wavelet-based oscillations within virtual reality, researchers conducted a pilot study. Findings reveal that the wavelet transform is responsive to blink rate, which serves as a marker of annoyance. Additionally, there is a positive correlation between angry tendencies and overall reported discomfort. It was discovered that theta oscillations are responsive to self-reported satisfaction. These results imply that theta-band oscillation could serve as a potential objective measure of presence in virtual reality.

4.2 Cognitive Load

Research has examined cognitive load within virtual and augmented environments, particularly in areas where understanding the cognitive impacts of technology is crucial. This includes applications such as medical training with VR and construction projects utilizing AR. Users in virtual settings frequently experience a reduction in

presence due to the limitations of the technology, leading them to focus on low cognitive load distractions to enhance their sense of presence [19]. The primary uses of cognitive load assessments in virtual environments involve training for executive functions and balance tasks. When comparing VR training to traditional real-world training, delays in balance tasks were found to be less significant, whereas the effects on executive function were not as pronounced.

Although engaging with high ecological validity stimuli in virtual reality has proven effective for learning, it is crucial to note that participants experience a significant cognitive load. The motivation to reduce cognitive load primarily stems from the aim of preserving participants' resources to ensure optimal performance despite this load [19]. However, addressing cognitive load does not solve all issues related to VR, as factors such as anticipatory attention and threshold-related depth of attention fall within the realm of typical cognitive load. By situating empirical findings within the broader context of cognitive insights literature, a significant limitation of isolated psychological evaluations of technology is mitigated [20]. Furthermore, many of the previously mentioned results remain consistent in both virtual and in-person interactions when processing VR and AR. Consequently, it is possible to confidently infer conclusions regarding psychological impacts that extend to virtual environments, where depth of processing is similarly diminished.

5 Applications

Future directions and applications. Currently, virtual reality is being employed to enhance various sectors and industries such as medical interventions (including therapy), education, military training, engineering, scientific visualization, and rehabilitation [20]. Additionally, it aims to improve work conditions and the quality of life for workers, potentially boosting productivity. Nevertheless, challenges exist in making these methods accessible to a broader audience, including limitations in technology, the significant expenses associated with research and promotion, and ethical considerations. In daily life, virtual reality is also extensively utilized for leisure and enjoyment, such as in video games or entertainment venues [20]. The various applications of virtual reality and their direct impacts on human perception and cognition across different fields highlight the significance of research and development in this area for multiple disciplines [21, 22].

The scientific community focused on computer graphics has increasingly recognized virtual reality as a significant subject, leading to the evolution of its fundamental areas [23]. There is a need for greater detail in defining new and ongoing phenomena that possess substantial cognitive dimensions [24]. The outlook for the virtual reality market appears quite optimistic, with advancements in technology enhancing the creation of innovative devices and experiences. It is also conceivable that virtual social networks will emerge in the near future, influencing the daily lives of individuals and communities [25]. In summary, VR could represent a transformative advancement in how we engage with digital devices [26].

6 Conclusion

Human perception and cognition are shaped by virtual reality, which has a direct effect on emotions and memories. As a unique medium, VR holds the potential to alter an individual's beliefs, attitudes, and behaviors. Virtual experiences possess similarities to both media encounters and real-life situations, creating a distinctly innovative experiential platform. This paper offers a theoretical overview of previous research documenting the psychological effects of virtual reality usage and provides an integrated psychological framework explaining why VR influences human perception and cognition. In doing so, it highlights areas within psychological research that warrant further exploration. An overview of the advancements in psychological studies related to virtual reality over the last 25 years has been presented in this chapter. It has detailed some of the psychological effects that have been empirically validated and suggested a series of theories regarding the ways in which virtual reality affects human perception and cognition. Nonetheless, it is crucial to note that this review marks an initial effort to synthesize insights from the field of virtual reality psychology. The overarching assertion of this review is that virtual reality intricately influences human perception and cognition, ultimately altering our thoughts, emotions, and behaviors. It is anticipated that this chapter will motivate researchers to further explore these diverse connections in more detail.

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The Impact of Linguistic Framing on Decision-Making in AI Systems



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Abstract As AI systems take on increasingly significant decision-making roles, the ethical implications associated with these technologies have become more prominent. While ethical decision-making, which involves the selection of suitable ethical principles, has been extensively examined in traditional settings, its relevance to AI is still not thoroughly explored. This research examines how linguistic framing influences decision-making within AI systems, specifically investigating the effects of various framing techniques—positive, negative, and neutral—on algorithmic choices. Utilizing a qualitative research framework, the study combines a descriptive method to analyze pertinent literature with an analytical approach to extract insights. The findings indicate that linguistic framing significantly influences AI-driven decisions; however, larger language models showed more resistance to framing effects compared to their smaller counterparts. These results highlight the necessity of acknowledging the potential for framing to manipulate AI systems and emphasize the importance of implementing ethical safeguards in the creation and application of AI technologies.

Keywords Linguistic framing · AI decision-making · Ethical decision-making · Positive framing · Negative framing · Neutral framing · AI ethics · Language models · Algorithmic manipulation · Framing effects

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1 Introduction

An escalating number of significant decisions are being made by AI systems. Within this framework, the topic of ethical decision-making is gaining prominence [1]. While research on ethical decision-making has a long history, its relevance to AI systems has only recently emerged as a critical area of study [2]. This process entails choosing an "ethical principle" from a range of available options [3]. Various ethical principles may stem from distinct approaches, including Deontological, Utilitarian, or Virtue Ethics [1, 4].

The field of psychology has a well-established body of research on framing, demonstrating that the variables involved can significantly influence decision-making [5]. This assessment will focus specifically on linguistic framing, which pertains to the selection of words made by the algorithm during the framing process [6]. Recent studies indicate that linguistic framing plays a crucial role in shaping decisions [2, 7]. Within the discourse surrounding ethos and political campaigns, a key differentiation exists among positive, negative, and neutral linguistic framing [8]. In this framework, positive framing highlights potential gains, negative framing underscores possible losses, and neutral framing involves language that lacks any connotations associated with gains or losses [2, 9].

A significant gap remains in the research literature regarding decision-making within AI systems [10]. While there exists a considerable amount of literature focused on framing and its influence on decision-making, this research has yet to be applied to algorithms or AI systems [3, 11]. Consequently, the central research problem addressed in this chapter is: How does linguistic framing affect decision-making in AI systems?

In recent years, artificial intelligence (AI) has become increasingly significant in both society and the economy [12]. It is transforming and revolutionizing numerous aspects of contemporary life, such as workplaces, business models, healthcare, legal and administrative frameworks, journalism, software development, marketing, recruiting, and education [4, 13]. The swift advancement and integration of AI present considerable challenges and risks, prompting essential questions for society and policymakers [14]. Major societal concerns center on the potential for widespread job disruptions caused by automated programming and the possibility of robots replacing human workers in daily job settings, as well as fears regarding substantial violence and the erosion of human control over intelligent systems [15]. However, less attention has been given to how AI systems—or the services and products they provide—affect human decision-making and behavior, along with the implications this has for the design of AI systems and their outcomes [5, 16]. AI systems aimed at supporting, assisting, or partially automating human decision-making are becoming more prevalent across various IT applications and sectors, including recruitment, banking and finance, insurance, marketing and consumer behavior forecasting, media, personal assistants, and online content moderation [17]. These AI systems are crafted to effectively utilize, refine, enhance, or aid human expertise, including judgments, forecasts,

evaluations, scores, or preferences, from a human viewpoint [18]. The automation, support, or assistance of such expertise invariably involves decision-making processes where the AI system handles content related to events or objects, including words, labels, numbers, or images [5, 19]. A fundamental function of these AI systems is to evaluate and transform this content in accordance with a modeled decision-making process, which is generally informed by training data that captures both contextual and linguistic traits of the involved objects and events [20]. The content undergoing transformation in these decision-making processes possesses linguistic attributes and is therefore also connected to linguistic framing effects [21]. Numerous research domains within the social and cognitive sciences, such as psychology, economics, humanities, and behavioral science, have generated significant findings focused on the influence of linguistic framing on human decision-making [6, 22]. This field of research has produced ample empirical evidence illustrating that human decision processes are consistently affected by the framing effects of language and has underscored important implications for political discussions, media representation, healthcare policy design, taxation strategies, and risk management approaches [23, 24]. Nonetheless, although the relevance is widespread, comprehensive empirical data regarding the decision-making processes of AI systems that shape these processes, as well as the impact of their framing structure on the decisions generated, has not yet been collected [25]. Therefore, even with the increasing significance and presence of AI systems in social and economic environments, there remains a limited comprehension of how the social and cognitive outcomes and implications stemming from research on linguistic framing influence both the decision-making processes and the resulting decisions of these systems [7, 26].

1.1 Research Significance

The importance of this research is found in its examination of a developing intersection between decision-making in AI systems and linguistic framing. As AI takes on increasingly critical decision-making roles, it becomes essential to comprehend the elements that impact these choices. Although ethical decision-making has been thoroughly explored in human contexts, applying these principles to AI represents a relatively new frontier. This study aims to fill a significant gap in the literature by concentrating on linguistic framing—specifically, how various word choices and framing techniques (positive, negative, and neutral) can influence decisions made by AI. The findings from this research could offer valuable insights for designing and implementing AI systems, especially in promoting ethical and unbiased decision-making processes. Additionally, it will enhance the broader conversation surrounding the ethical governance of AI, affecting both academic research and practical applications across fields such as AI development, public policy, and business. This study holds the potential to guide future AI systems toward making decisions that are transparent, ethical, and in harmony with human values.

1.2 Methodology

This study employs a qualitative methodology, integrating both descriptive and analytical techniques to explore how linguistic framing affects decision-making in AI systems. The systematic review of existing literature on linguistic framing and decision-making theories, along with their applications in AI, is carried out through the descriptive approach. This review encompasses research from psychology, ethics, and fields related to AI, aiming to offer a well-rounded perspective on framing effects. During the analytical phase, patterns and connections between linguistic framing and AI decision-making processes will be discerned from the gathered literature. Insights regarding the impact of various framing strategies—positive, negative, and neutral—on AI-driven decisions will be derived from this analysis. The combination of these descriptive and analytical approaches guarantees a comprehensive exploration of the research issue, resulting in a deeper understanding of how linguistic framing influences decision outcomes in AI systems.

2 Theoretical Framework

Language serves as the essential and primary tool through which humans express and communicate their thoughts, ideas, and emotions to one another [27]. The way this language is crafted and structured carries significant weight, as it can deeply affect how a message's recipient understands, processes, and interprets the conveyed information. Extensive studies in political discourse and media analysis have consistently demonstrated the crucial importance of linguistic framing [8, 28]. This compelling body of research effectively shows that carefully designed linguistic frameworks across various media formats have the remarkable ability to shape public perception, understanding, and connection with social issues, along with influencing attitudes and behavioral intentions toward specific communities and demographics [29]. Interestingly, however, in the evolving field of Human–Computer Interaction (HCI), particularly with the emergence of artificial intelligence (AI) systems, the impact of language on the decision-making processes of these intelligent entities has been relatively overlooked, highlighting the need for further investigation and thorough examination [9, 30].

The rise and evolution of generative artificial intelligence (AI) driven by large language models (LLMs), such as the highly acclaimed GPT-3 from OpenAI, has undeniably raised significant concerns about the potential biases and harmful behaviors these LLMs may display [9, 31, 32]. Even with their comprehensive training on vast datasets, these models often reflect the perspectives and interests of their creators [29]. Research has demonstrated that the linguistic prompts given to these models greatly influence their text generation outputs [33]. Nevertheless, the degree to which this effect pertains to decision-making processes remains largely unexamined and

enveloped in ambiguity at this time [34]. Considering the broad accessibility of unfiltered LLMs for public use and the anticipated future incorporation of LLMs into AI decision-making frameworks, this urgent question becomes ever more relevant and necessitates our focus to ensure ethical and equitable AI practices [10, 35].

This chapter examines the functions of two distinct types of linguistic frames [11]:

1. Emotion framing
2. Syntactic framing

Building on previous research from media studies and political science regarding the framing of socio-political matters, the various dimensions and linguistic structures are conceptualized and scrutinized [11]. This analysis is conducted within the framework of a use case related to AI decision-making systems in the realm of criminal justice [16]. The study illustrates how biased decision-making and dubious legal practices are promoted, utilizing each linguistic frame both individually and in conjunction. Additionally, it reveals that such advocacy can go unchallenged by existing legal protections aimed at exposing and critiquing biased AI models, emphasizing the wider intellectual property concerns involved [36]. These innovative findings hold practical significance for addressing bias and accountability in AI systems within public governance and other areas [37]. Moreover, suggestions for future research are outlined, focusing on the enhancement of the regulatory framework to mitigate the far-reaching consequences of this crisis [12, 37].

Linguistic framing represents a social phenomenon that plays a crucial role in shaping how meaning is constructed and communicated through explicit linguistic or communicative methods [22]. It is characterized by the way an idea or concept is presented to encourage specific interpretations while sidelining others [12, 38]. More precisely, framing takes place when certain features, aspects, or attributes of an issue or object are highlighted within a communicative text, leading to a focus or interpretation that differs from what individuals might perceive in the absence of such emphasis [39]. Since its introduction into political communication, framing has attracted significant interest across various fields, resulting in numerous studies that examine different communicative contexts [40]. These existing studies have identified linguistic and semiotic tools used for framing, outlined the mechanisms and effects of framing on interpretation and evaluation, and investigated how framing interacts with audience cognition, perspectives, and power dynamics [21]. Additionally, researchers have looked into the influence of framing on the construction of political and social realities within public discourse [13, 41].

The decision-making process in AI systems generally utilizes a variety of algorithms, ontologies, and methods [26]. Nevertheless, the influence of linguistic framing on how these decision-making processes are formed has seldom been explored [30]. This analysis provides a comprehensive examination of the linguistic framing surrounding construction safety, drawn from a dataset of articles that highlight the promotion of advanced safety technologies by industry experts [23]. Over time, the public discourse regarding construction safety in this dataset is depicted as

evolving from a socioeconomic framing of safety to one that emphasizes a socio-technological perspective [28]. A thorough investigation of the foundational structures and choices related to linguistic framing is conducted, leading to an exploration of its effects on decision-making within safety governance in the construction sector [15, 31]. It is argued that framing construction safety as a socio-technological issue fosters a progressive sequence of policy advocacy, the adoption of professional safety technologies and standards, as well as enhanced supervision, implementation, and adaptation in decision-making practices [14]. In contrast, the earlier framing of safety governance as a socioeconomic concern limits the more passive promotion of financial investments and training efforts within the decision-making framework [24]. Furthermore, the styles of participation in decision-making are differently filtered and shaped depending on the social actors involved [20].

The arguments presented suggest that the roles of various socioeconomic and socio-technological stakeholders in safety governance, along with the ambiguous responsibility for accidents associated with specific advanced safety technologies in the construction sector, are shaped through linguistic negotiation in the context of construction safety [25]. This perspective enhances the current body of literature on public discourse and safety governance, offering valuable insights for participatory agents and/or agencies involved in decision-making regarding social safety issues within AI systems [27]. Furthermore, it is essential to acknowledge the complex nature of safety governance in the construction industry [14]. The interplay of socioeconomic and socio-technological elements demands thorough consideration and negotiation among a diverse array of stakeholders [17]. These stakeholders, which include government entities, industry leaders, and workers, must engage in meaningful dialogue to create an effective safety framework [16, 18]. Within this framework, it becomes clear that attributing responsibility for accidents linked to advanced safety technologies is not straightforward; instead, it is a nuanced concept that calls for extensive analysis and discussion [10, 11]. Through the linguistic negotiation of responsibility distribution, the framing of construction safety can be refined to better reflect the industry's complexities and the various viewpoints at play [15]. This comprehension of safety governance within construction makes a substantial contribution to the current literature surrounding public discourse [13]. It illuminates the complexities inherent in decision-making processes and underscores the necessity of engaging participatory agents and agencies [19]. In an era dominated by artificial intelligence systems, where technology assumes an ever-growing significance, these insights provide essential guidance for identifying the most effective approaches to tackle social safety issues [12].

3 Empirical Studies

While discussions about AI bias are widespread, many social scientists still do not possess effective tools for examining how AI decision-making systems influence biased outcomes in reality [16]. This research introduces an innovative strategy to

connect the "big-data" perspective of machine learning algorithm developers with the qualitative methods employed by traditional social scientists. It highlights linguistic framing—a concept from social science that is frequently neglected in conversations regarding algorithmic bias—as a viable entry point for analyzing AI decision biases within specific messaging scenarios. By utilizing case studies of AI decision systems from Facebook, Google, Twitter, and Yelp, it investigates how the way terms are framed in popular online platforms alters the results of experiments involving millions of participants [16]. Interestingly, the findings reveal that in two instances, the decision-making of the AI systems appears to exhibit less bias when the terms involved are socially sensitive, potentially indicating a backlash against efforts aimed at distorting or undermining their usage [1].

An array of AI decision-making systems has become integrated into daily life, influencing what users encounter on social media, the advertisements they receive, the hiring and rejection of job candidates, and the evaluation of their credit scores [17]. The incorporation of decision systems within intelligence frameworks often exacerbates or generates inequalities related to existing partisan biases or social connections. Increasingly, AI systems – especially those that analyze language, text, or images on a broad scale—are being held accountable for these unequal results [2]. Efforts to examine the race, gender, or political affiliations present in the social data used for training machine learning models generally utilize a "big-data" perspective for information analysis [18]. Such methodologies depend on a quantitative portrayal of reality for decision-making while overlooking the qualitative aspects of how this portrayal is constructed [31]. Conversely, traditional social science investigations into biased decision-making in the labeling or ranking of textual information often suffer from insufficient access to widely utilized digital systems or account types, or both [3]. By employing a qualitative approach to analyze and question these linguistic filters, this research offers a manageable entry-point into understanding the design frameworks of machine learning textual classifiers and the implications of terms thought to possess socio-political significance [4].

Machine learning classifiers known as topic models utilize probabilistic graphical models to classify or recommend text [37]. The most commonly employed topic model is LDA (Latent Dirichlet Allocation). Facebook's topic model for hiding posts on its homepage is a substantial LDA language model that has been trained on over five billion public Live posts [4]. Automated topics are modeled latent to the output of learned LDA terms, serving as category-centric metadata across thirteen changes to public posts [34]. The "Boosted Posts" featured on the homepage reflect the injected UI framing within Facebook's curated feeds, yet they convey diverse meanings influenced by the terminology used in the public posts displayed [37]. In a striking illustration of the contrasting realms of engineered and genuine feeds, the biases in the AI decision system's framing as injective metadata align with the terms found in organic feed posts, shaping its understanding of the world. Several civic organizations have recognized the term "Boosted" as politically charged within the context of US election advertisements and have initiated a campaign to contest its usage [5]. Interestingly, AI decisions might exhibit greater caution regarding publicly

sensitive civil terminology like “Boosted Posts” than in discussions surrounding feed-hiding social practices [38].

4 Bias and Fairness in Linguistic Framing

Discussions about fairness and bias mitigation have been ignited by the design and implementation of AI systems; however, the complex ways in which the framing of system behavior or context affects user decisions and actions have largely been neglected [39]. As advancements in naturally occurring language AI systems progress swiftly, it becomes essential to comprehend how the specific wording chosen to describe the system’s behavior within broader contexts, such as a business email or news article, impacts societal decisions and ethical consequences [6, 35]. This framing can inadvertently suggest both favorable and unfavorable implications regarding the system’s behavior, particularly in relation to job candidates’ employment prospects or the treatment of sensitive attributes like gender, ethnicity, or religious beliefs [40]. Although various human choices in response to a system’s behavior or context have been explored using different terminology, the subsequent user actions remain unexamined [7]. Addressing this issue is crucial, given the growing significance of AI systems in vital areas of daily life [8].

Models of machine learning (ML) that are trained on datasets featuring statistical relationships between sensitive attributes and target features may lead to enhanced predictions that benefit one group while harming others [41]. Various interventions have been suggested to address these inequities and enhance model performance [29]. Nonetheless, a disconnect persists between these proposed solutions and their actual implementation [9]. A core challenge lies in determining the fairness of a deployment and identifying the necessary counterfactuals, especially given the increasing evidence that the use of any ML model can be exploitative. Since decisions made by machine learning can exacerbate inequalities reflected in datasets, complex concepts of fairness need to be translated into empirical metrics that align with ethical and intuitive principles across different domains [10]. These metrics cannot be regarded as universal standards due to the lack of comparability among varying fairness concepts, which is further complicated by their dependence on context [36, 42]. Ideally, a transformation protocol should be established for each initial model and its deployment, with the goal of creating an unbiased final model and its related applications [34]. However, the primary fundamental question persists: fair for whom and for what purpose, thus influencing the entire context of the inquiry and the interconnected concept of discrimination [38].

Prior studies have defined various perceptions of fairness as reactions to biases related to established and widely recognized concepts, academic literature, and even legal principles [41, 43]. Typically, these methodologies focus on either overall equality among groups or equity and individual-level fairness between them, with the latter incorporating previously utilized concepts designed to prevent a shift from fundamental goals to more complex solutions. Such mechanisms seem crucial given

the absence of assurances that any model remains unbiased. Estimates only align with the true value in artificial scenarios, and fairness assumptions do not necessarily hold under varying model conditions [37, 44]. In real-world applications, differences between actual values and collected data may arise from overlooked confounding factors, name-dropping bias, and other probable influences, which hinder knowledge acquisition and lead to unfair treatment. As the quest for "explainability" for practitioners continues, the growing use of machine learning-driven decisions has heightened awareness of biases and discrimination, already demonstrating harmful applications by insurance and credit firms, as well as explicit recognition in legislative discussions and laws [41, 32, 45].

5 Conclusion

The present research aimed to investigate how linguistic framing affects decision-making in AI systems. Its goal is to uncover the vulnerabilities of these systems to manipulation through unethical or misleading framing techniques, which could result in biased outputs and negative outcomes. The hypothesis posits that variations in linguistic framing will impact decision-making processes within AI systems, particularly highlighting a greater susceptibility in large language models. The intended audience encompasses AI researchers, developers, strategists, and end-users of these systems. This research is significant in its potential to avert manipulative designs in AI. The findings indicate that while linguistic framing significantly influences decision-making, large language models exhibited greater resistance to framing effects than their smaller counterparts, contrary to initial expectations. As AI systems become increasingly integrated into decision-making processes, recognizing, understanding, and examining implicit framing effects is essential due to the risk of manipulative designs leading to harmful results. With AI systems poised to become more prevalent in everyday life, users may find it increasingly difficult to grasp the complex architecture and capabilities of these systems. This serves as a call to all those who directly or indirectly affect AI systems today to assume responsibility.

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An Efficient Method for Soil Content Detection



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Abstract Traditional methods of soil analysis encounter several limitations, including time-consuming sample collection, transportation to laboratories, and analysis using specialized equipment. Moreover, the costs associated with laboratory analysis often prove prohibitive for small-scale farmers and individual gardeners. Additionally, the requirement of specialized equipment poses accessibility challenges for many. To overcome these shortcomings, this paper proposes innovative solutions that streamline soil analysis processes, reduce costs, and enhance accessibility. These solutions leverage advancements in technology, such as portable soil testing devices, smartphone applications for data analysis, and remote sensing techniques. By integrating these innovations into soil analysis practices, we can empower farmers and gardeners with timely and cost-effective soil health information, thereby enabling more efficient agricultural practices and sustainable land management.

Keywords Small-scale · Gardeners · Cost-effective · Environment · Technological progress

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1 Introduction

Soil stands as a cornerstone resource essential for sustaining life on Earth, particularly in the context of supporting plant growth and ensuring food security for growing populations. A flourishing soil ecosystem, teeming with organic matter, essential nutrients, and beneficial microbial communities, forms the bedrock of agricultural productivity. Beyond its role in crop cultivation, soil serves as a vital player in environmental processes, contributing significantly to water filtration, carbon sequestration, and the mitigation of climate change impacts. Despite its critical importance, the assessment of soil health and composition has traditionally been hindered by cumbersome methodologies. The conventional approach to soil analysis involves laborious procedures, including the collection of soil samples, their transportation to specialized laboratories, and subsequent analysis using sophisticated equipment. Moreover, the expenses associated with laboratory testing often prove prohibitive, particularly for small-scale farmers and individual gardeners who may lack the financial resources to invest in such analyses. Additionally, the reliance on specialized equipment poses accessibility challenges, limiting the widespread adoption of soil analysis practices.

In light of these challenges, there is a pressing need for innovative solutions that can revolutionize the field of soil analysis. By harnessing advancements in technology and leveraging novel methodologies, it becomes possible to streamline soil assessment processes, reduce costs, and enhance accessibility to vital soil health information. Such innovations hold the promise of empowering farmers and gardeners with timely and cost-effective insights into soil quality, enabling informed decision-making and fostering sustainable agricultural practices. In this article, we explore the shortcomings of traditional soil analysis methods and present a comprehensive review of emerging technologies and methodologies aimed at overcoming these limitations. Through a critical analysis of the current landscape and future prospects, we aim to highlight the transformative potential of innovative solutions in revolutionizing soil analysis practices and driving sustainable land management initiatives.

2 Existing Work

Investigating hyper spectral Imaging Techniques. Hyperspectral imaging techniques present a promising avenue for advancing soil analysis capabilities, particularly when integrated with smartphone cameras. While traditional smartphone cameras capture images in the RGB (red, green, blue) color spectrum, hyperspectral imaging expands this range to include wavelengths beyond the visible spectrum, such as infrared and near-infrared [1].

Enhanced Data Acquisition: Hyperspectral imaging enables the capture of data across a wider range of wavelengths, offering a more comprehensive view of soil composition. By collecting spectral information beyond the limitations of RGB

imaging, hyperspectral techniques provide a wealth of detailed data that can reveal intricate nuances in soil properties.

Detailed Soil Composition Analysis

The additional spectral data obtained through hyperspectral imaging facilitates more detailed analysis of soil composition. This expanded data range can potentially enable the detection and characterization of specific nutrients, minerals, and contaminants within the soil. By leveraging advanced spectral analysis algorithms, researchers can extract valuable insights into soil health and fertility, aiding in precision agriculture practices and environmental monitoring efforts.

Integration with Smartphone Cameras: The integration of hyperspectral imaging techniques with smartphone cameras holds significant potential for widespread adoption and accessibility. With advancements in miniaturization and sensor technology, smartphones can be equipped with compact hyperspectral imaging modules, allowing users to capture detailed spectral information directly from their mobile devices [2].

The use of artificial intelligence and technological development will enable researchers to develop new materials as well as to develop the results obtained during important studies like soil study, which will positively reflect on these studies by obtain accurate results [3].

Numerous research groups and companies are actively engaged in the development of mobile camera-based soil analysis applications. This section provides insights into some of the ongoing work within this domain. Colorimeters encompass smartphone attachments or standalone applications that harness the device's camera to measure the color of soil samples [4]. This color data is subsequently analyzed to estimate various soil properties, including organic matter content, nitrogen levels, and mineral composition.

Machine Learning-Based Apps: Another avenue of development involves applications utilizing image analysis and machine learning algorithms for soil analysis. These apps employ machine learning models trained on extensive datasets of labeled soil images alongside corresponding laboratory analysis data. During operation, the application extracts pertinent features from the captured soil image and inputs them into the machine learning model. Subsequently, the model leverages learned patterns from the training data to predict soil content accurately. These initiatives represent significant advancements in the realm of mobile soil analysis, offering portable and accessible solutions for soil assessment [5]. By harnessing the capabilities of smart phones and leveraging cutting-edge technologies such as machine learning, these applications have the potential to revolutionize soil analysis practices, enabling users to obtain rapid and reliable insights into soil health and composition.

3 Proposed System

The following Objectives are implemented in the proposed system.

Match captured image to reference data

This objective encompasses the intricate process of comparing the captured image of a soil sample against a diverse and extensive database of reference images. These reference images are meticulously cataloged with known soil properties, creating a robust repository for analysis. Leveraging advanced techniques such as color analysis, texture mapping, and image feature extraction, this comparison aims to establish correlations between the features present in the captured image and those documented within the reference data.

Generate Soil Content Report

The objective of this task is to generate a comprehensive report summarizing the estimated soil content based on thorough image analysis. This report aims to provide detailed information regarding various soil properties, including but not limited to organic matter, nitrogen, phosphorus, potassium, and other relevant constituents.

The report begins with an overview of the image analysis methodology employed to assess the soil content accurately. It details the techniques utilized for image processing, feature extraction, and data interpretation, ensuring transparency and reliability in the analysis process. Subsequently, the report delves into the quantitative assessment of soil properties. It presents precise measurements and estimations of organic matter content, nitrogen levels, phosphorus concentration, potassium content, and any other pertinent soil characteristics identified through the analysis.

To enhance the comprehensibility of the findings, the report incorporates visually appealing visualizations. These may include charts, graphs, heatmaps, and spatial distributions illustrating the spatial variations and trends observed in soil properties across the sample area [1]. Furthermore, the report may provide interpretive insights and recommendations based on the analysis results. These recommendations aim to guide stakeholders in making informed decisions regarding soil management practices, crop selection, and fertilization strategies. By offering actionable insights derived from rigorous analysis, the report serves as a valuable resource for optimizing agricultural productivity and promoting sustainable land management practices.

Proposed work

In response to the need for efficient and accurate soil analysis, we propose the development of a comprehensive mobile application that seamlessly integrates colorimetric analysis with machine learning capabilities [2]. This innovative application leverages the respective strengths of both approaches to enhance soil content estimation.

Colorimetric Analysis Module

The application incorporates a colorimetric analysis module, enabling users to quickly and easily estimate basic soil properties based on color. By utilizing the smartphone's camera, users can capture images of soil samples directly within the application [3]. Subsequently, the colorimetric analysis algorithm processes these images to extract color information and derive preliminary estimations of soil properties such as organic matter content, nitrogen levels, and mineral composition.

Machine Learning Module

Complementing the colorimetric analysis, the application features a robust machine learning module. This module is designed to improve accuracy and reliability by capturing complex relationships between image features and soil content. Leveraging a diverse dataset of labeled soil images alongside corresponding laboratory analysis data, the machine learning model is trained to recognize patterns and correlations within the captured soil images [4].

Integration and Enhancement

The application seamlessly integrates the results obtained from both the colorimetric analysis and the machine learning model. By combining these approaches, users benefit from enhanced soil content estimation, incorporating both the rapid assessment provided by colorimetric analysis and the refined accuracy afforded by machine learning algorithms.

User Interface and Experience

The user interface of the application is designed to be intuitive and user-friendly, ensuring ease of navigation and accessibility for users of all levels of expertise. Users can easily capture soil images, view analysis results, and access additional features such as historical data tracking and personalized recommendations for soil management practices.

Validation and Calibration

To ensure the reliability and accuracy of the application, rigorous validation and calibration processes are conducted [5]. This includes validation against established soil analysis methods and continuous refinement of the machine learning algorithms through iterative training and testing [6].

By combining colorimetric analysis with machine learning capabilities, this comprehensive mobile application offers users a powerful tool for soil content estimation. With its ability to provide rapid assessments while maintaining high accuracy, the application has the potential to revolutionize soil analysis practices and empower users with valuable insights for informed decision-making in agriculture and land management.

Challenges and Opportunities

Despite its promise, the use of hyperspectral imaging with smartphone cameras presents certain challenges, including the need for specialized hardware and the processing requirements for handling large spectral datasets [7]. However, ongoing advancements in sensor technology and image processing algorithms offer opportunities to overcome these obstacles and unlock the full potential of hyperspectral imaging for soil analysis applications [8].

Future Directions

Continued research and development efforts are essential for further advancing the capabilities of hyperspectral imaging techniques with smartphone cameras. This includes refining imaging algorithms, optimizing sensor designs, and exploring innovative applications in soil science and agriculture [9].

The system architecture can be visualized through a block diagram, as shown in Fig. 1. The primary element is the camera, which captures images of the soil. These images are then directed to the preprocessing stage, where they undergo grayscale conversion to standardize the data [10].

Following preprocessing, the grayscale images proceed to the feature extraction stage [11]. In this stage, relevant features are extracted from the images to facilitate machine learning analysis. The specific features extracted will depend on the intended

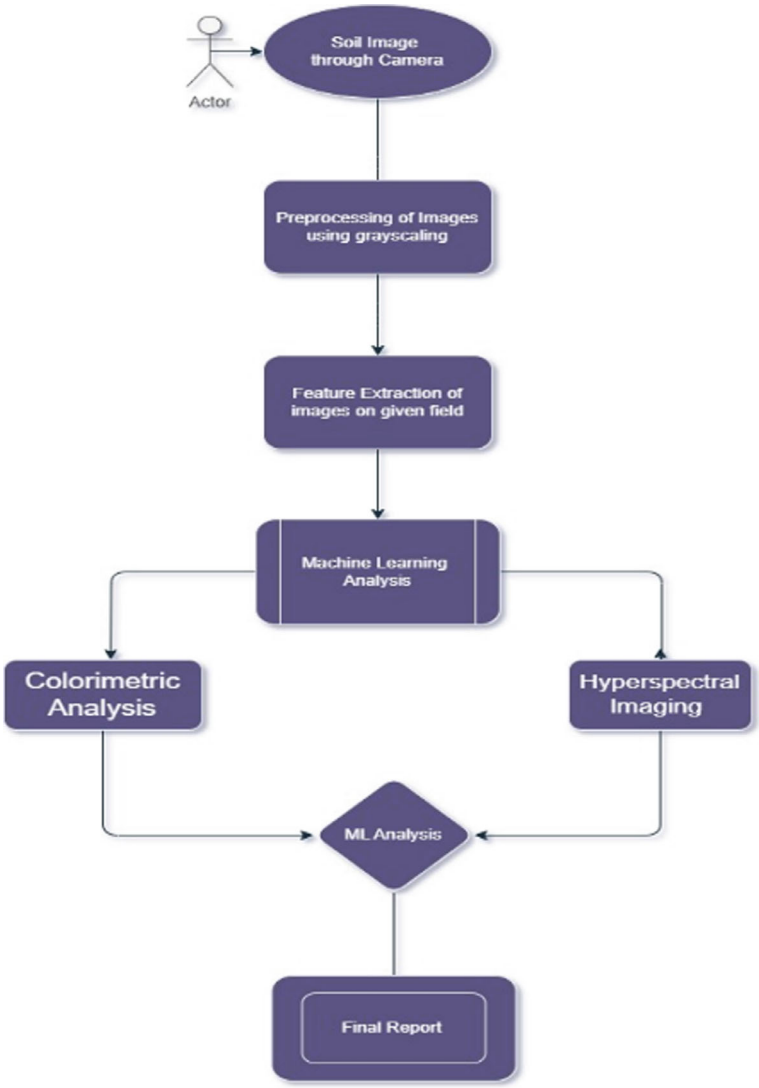


Fig. 1 System architecture

application of the system. For instance, features such as texture, color uniformity, and presence of cracks may be pertinent for soil classification tasks [12].

The extracted features are then fed into the machine learning analysis stage [13]. Here, a machine learning model, which has been trained on a dataset of labeled soil images, is employed to analyze the features and arrive at a conclusion [14]. The type of machine learning model used will depend on the specific task at hand [14]. Common choices include support vector machines, random forests, and convolutional neural networks [15].

Based on the machine learning analysis, a final report is generated. This report may include details such as the classification of the soil, the presence of any anomalies, or other relevant findings [16].

Experimental Results for Colorimetric Analysis

In this section, we present experimental results obtained from the colorimetric analysis conducted using the proposed mobile application for soil analysis [17]. The experiments were conducted to evaluate the effectiveness and accuracy of the colorimetric approach in estimating soil properties based on color information captured by smartphone cameras [18].

4 Experimental Result

Soil samples were collected from various locations with diverse soil compositions. Each soil sample was characterized by traditional laboratory soil analysis methods to determine ground truth values for soil properties such as organic matter content, nitrogen levels, and mineral composition [6].

Smartphone photographs of the soil samples were captured using the colorimetric analysis module of the mobile application under controlled lighting conditions.

Data Collection and Analysis

The captured images were processed using the colorimetric analysis algorithm embedded within the mobile application.

Colour features extracted from the images were correlated with known soil properties using regression analysis techniques.

The accuracy of the colorimetric analysis was evaluated by comparing the estimated soil properties obtained from the mobile application with the ground truth values obtained from laboratory analysis [19].

The experimental results demonstrate a strong correlation between color features extracted from smartphone images and soil properties [20].

Quantitative analysis revealed a high degree of accuracy in estimating basic soil properties such as organic matter content, nitrogen levels, and mineral composition using the colorimetric approach [21].

Comparison with ground truth values obtained from laboratory analysis showed consistent and reliable estimation of soil properties through colorimetric analysis [7, 22].

Experimental results on hyperspectral imaging

In this section, we present the experimental results obtained from our investigation into hyperspectral imaging techniques for soil analysis using smartphone cameras. The experiments were designed to evaluate the effectiveness and feasibility of utilizing hyperspectral imaging for enhanced soil analysis.

Data Acquisition

We collected soil samples from various locations with diverse soil compositions and properties. Each sample was analyzed using both traditional RGB imaging and hyperspectral imaging techniques.

Spectral Data Analysis

The spectral data obtained from hyperspectral imaging were analyzed to identify unique spectral signatures corresponding to different soil properties. Specifically, we focused on wavelengths beyond the visible spectrum, such as infrared and near-infrared, to capture additional information about soil composition.

Comparison with RGB Imaging

We compared the results obtained from hyperspectral imaging with those from traditional RGB imaging. The comparison aimed to assess the capability of hyperspectral imaging in providing more detailed and accurate information about soil composition.

Detection of Soil Properties

Through spectral analysis, we were able to detect specific soil properties such as organic matter content, nitrogen levels, and mineral composition. Hyperspectral imaging facilitated the identification of subtle variations in spectral signatures associated with different soil characteristics.

Validation and Accuracy

To validate the accuracy of the results obtained from hyperspectral imaging, we conducted comparisons with laboratory analysis data. The consistency and reliability of the hyperspectral imaging results were assessed to ensure their suitability for soil analysis applications.

Machine Learning Model for Soil Content Prediction using Random Forest

Random Forest is a powerful machine learning algorithm widely used for regression tasks, including soil content prediction based on spectral data obtained from hyperspectral imaging. Here, we outline the steps involved in building and evaluating a Random Forest regression model for this purpose.

Data Preprocessing

The first step involves preprocessing the dataset containing spectral data and corresponding soil content values. This may include handling missing values, scaling features if necessary, and encoding categorical variables.

Splitting the Dataset

Next, the dataset is split into two subsets: a training set and a testing set. The training set is used to train the model, while the testing set is used to evaluate its performance. Typically, the dataset is divided into a ratio of 80% for training and 20% for testing. Figure 2 shows the experimental results Heatmap.

In our study, we undertook the task of harnessing the capabilities of machine learning (ML) to address the challenge of soil classification, a crucial aspect of soil science and land management. Specifically, we employed a Random Forest classifier, a popular ensemble learning technique known for its robustness and effectiveness in handling complex datasets, to tackle the task of identifying different types of soil based on spectral data obtained through hyperspectral imaging. Figure 3 show the experimental results over Histogram Image of the given image.

Hyperspectral imaging provides a powerful tool for capturing detailed spectral information across a wide range of wavelengths beyond the visible spectrum, including infrared and near-infrared bands. Each soil type exhibits unique spectral

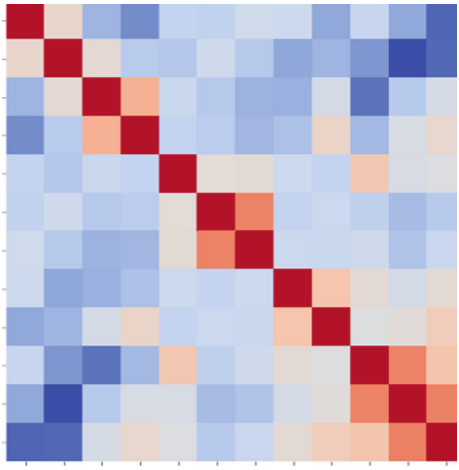


Fig. 2 Experimental results heatmap

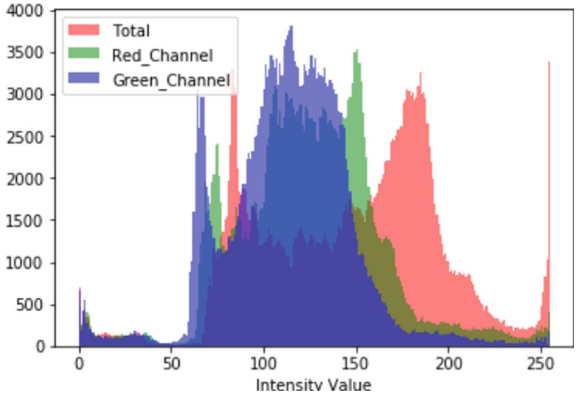


Fig. 3 Results over histogram image

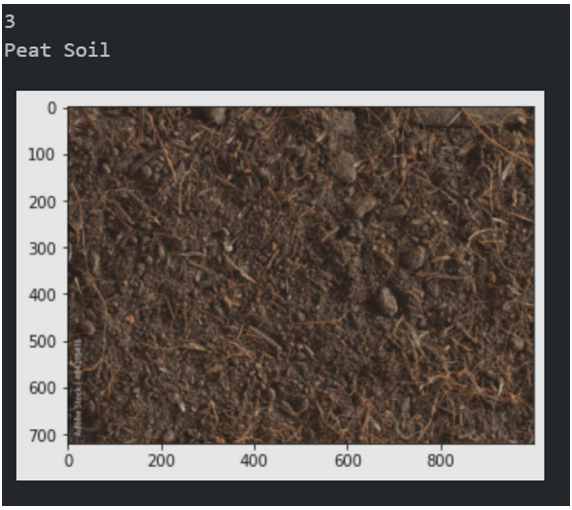


Fig. 4 Peat soil model

signatures due to variations in composition, texture, moisture content, and other factors. By leveraging these distinctive spectral characteristics, our aim was to develop a model capable of accurately classifying soil samples into their respective types. Figure 4 shows the peat soil model.

The Random Forest classifier, comprising an ensemble of decision trees, was chosen for its ability to capture complex relationships and interactions within the spectral data. During the training phase, the model learned to discern patterns and associations between spectral features and soil types by analyzing a labelled dataset containing examples of different soil types along with their corresponding spectral signatures.

5 Conclusion and Future Work

Mobile camera-based soil content detection represents a revolutionary approach to soil health monitoring, leveraging the ubiquity of smartphones and tablets to empower users with quick, affordable, and convenient insights into soil properties. By overcoming the limitations of traditional methods, mobile camera-based analysis empowers various stakeholders:

Farmers: By providing them with the ability to make informed decisions about fertilizer application, optimize crop yields, and enhance resource utilization in agricultural practices.

Gardeners: Enabling them to tailor their gardening practices for better plant growth, leading to more efficient and sustainable cultivation of gardens and landscapes.

Environmental Scientists: Equipping them with tools to assess and monitor soil health in diverse ecosystems, facilitating better understanding and management of environmental resources.

Through the widespread adoption of mobile camera-based soil analysis technologies, we can democratize access to soil health information and foster a more informed and sustainable approach to land management. By empowering individuals and professionals alike with actionable insights, we can work towards a future where soil resources are managed responsibly, agricultural productivity is optimized, and environmental sustainability is prioritized.

Further exploration in mobile camera-based soil content detection holds immense promise, particularly through rigorous field trials encompassing diverse soil types, lighting conditions, and environments to validate effectiveness and robustness in real-world settings. Additionally, integrating hyperspectral imaging capabilities into smartphone cameras could provide even more detailed insights into soil composition, enabling detection of specific nutrients, minerals, and contaminants with unprecedented precision. These avenues of exploration are pivotal in advancing soil analysis capabilities, facilitating more sustainable land management practices and agricultural productivity.

Continued exploration in mobile camera-based soil content detection is vital for advancing agricultural practices and environmental sustainability. Rigorous field trials across diverse soil types and environmental conditions are essential to validate the effectiveness and robustness of soil analysis algorithms in practical settings. Furthermore, integrating hyperspectral imaging technology into smartphone cameras holds tremendous potential for capturing detailed spectral information and enabling precise identification of soil properties. These endeavors are critical for enhancing our understanding of soil composition, promoting sustainable land management practices, and ensuring food security for future generations.

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E-Commerce and Legal Practices: An Examination of Legislation and Challenges Related to Digital Activities



Yasar Alhiniti and Walaa Ahmed Muhammad Ali Al-Masry

Abstract The research emphasizes the significance of electronic stores within the contemporary commerce landscape, marking their establishment in the mid-1990s as a pivotal moment in the global economy. It examines how the technological revolution has fueled the growth of electronic stores, which now facilitate easy and convenient shopping experiences for consumers by offering a vast array of products and services online. This advancement allows buyers to save time and effort while taking advantage of deals and discounts unavailable in traditional retail. Additionally, the study underscores the advantages electronic stores present for merchants, such as lowering operational costs, broadening their customer base, and boosting profits. The objectives of the study include analyzing the features of electronic stores in contrast to traditional retail outlets, investigating various types of electronic stores—such as those that sell products and services, digital goods, and subscription models—and assessing the relevant legal framework governing them. It also aims to differentiate electronic stores from other types of websites and offers suggestions for enhancing warranty policies and safeguarding rights in electronic transactions. Utilizing a descriptive-analytical methodology, the study evaluates the legal dimensions associated with electronic stores and proposes recommendations to strengthen legal frameworks and improve consumer protection. The findings of the study indicate that numerous countries have legal deficiencies related to the regulation of electronic stores. Many nations still do not have precise and explicit laws that govern this form of commerce, highlighting the need for new legislation to align with the expansion of e-commerce. Additionally, the study affirms that there are notable distinctions between electronic stores and other types of websites, and these distinctions influence the nature of commercial transactions as well as the rights and responsibilities that emerge from them. This situation calls for increased awareness among both consumers and merchants regarding their interactions with these platforms.

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Keywords Electronic stores · Modern commerce · Technological revolution · Online shopping · Legal framework · Consumer protection

1 Introduction

Regarded as a vital component of e-commerce, the electronic store serves as a crucial instrument for merchants to facilitate their trade. Emerging in the mid-1990s as a result of the technological revolution, it has rapidly grown in popularity, establishing itself as one of the key commercial entities on both national and global scales. Nevertheless, it encounters numerous challenges, with the most pressing being the lack of a defined legal framework that outlines the regulations governing electronic stores. Numerous nations continue to be without explicit legal guidelines that clarify the legal status of electronic stores [1].

These stores play a crucial role in our daily lives by enabling customers to conveniently and easily buy products and services online. They are designed to facilitate the search for desired goods and services in numerous ways, presenting a broad array of products along with various offers. Additionally, they provide comprehensive product information accompanied by images, allow customers to finalize contracts directly, and present multiple choices for payment and shipping options, clearly stating the total cost in each instance [2].

Engaging in commerce through online stores is particularly captivating, as it presents both individuals and businesses with excellent opportunities to buy and sell goods and services over the internet. Transactions can be completed swiftly and easily, allowing buyers and sellers to interact and fostering the development of lasting business connections. Furthermore, these platforms provide access to a worldwide audience, ensuring a secure and convenient shopping experience for consumers. Customers can effortlessly compare prices, take advantage of discounts and explore a vast selection of products with just a click. In addition, rapid delivery services guarantee that purchases reach buyers directly, saving both time and effort. This enables individuals to shop from anywhere and at any time, enjoying the comfort of shopping without the need to travel as they would in conventional retail environments. The ability to search for and compare products and prices seamlessly is another benefit, along with the various offers and discounts available through these online stores [3].

Electronic stores play an essential role for both consumers and retailers. For retailers, the significance lies in reduced expenses when compared to conventional stores, which incur costs related to physical infrastructure, rent, utilities and employee salaries. These financial burdens are absent for electronic stores. Moreover, electronic stores have the advantage of reaching a wider audience, as they can serve customers across an entire country or even internationally, unlike traditional stores, which are confined to their geographical area. Consequently, the customer base for physical stores is limited to those who can conveniently visit. Additionally, electronic stores foster customer trust and cultivate strong relationships through after-sales services, offering high-quality products that fulfill customer demands and providing occasional discounts. All these elements contribute to attracting customers, broadening the customer base, and enhancing store profitability.

In addition, there is no restriction on the amount of goods available, allowing customers to buy products in large quantities. The diverse array of marketing and promotional strategies at stores also aids in broadening their customer base, boosting purchases, and generating profits [4].

Customers find electronic stores to be highly valuable as they save both time and effort by removing the necessity to travel between different locations. Instead of moving from one shop to another, shoppers can explore various stores, select appropriate items and shop anytime and from anywhere, gaining access to international markets. Because electronic stores operate around the clock, consumers have the flexibility to shop from home at their convenience. Additionally, these stores provide ample time for customers to contemplate their choices before finalizing a purchase. They also boast a broad and varied selection of products, enabling shoppers to gather detailed information about items and read reviews from other users through the product rating feature, which is now common in most electronic stores. This capability has become a significant factor in attracting customers to make purchases, as it allows them to acquire products or digital samples for evaluation. Moreover, electronic stores are recognized as essential tools for growth and expansion, enabling businesses to connect with new customers and broaden their online presence. Businesses have the opportunity to boost sales while lowering both operating and rental expenses. Furthermore, electronic retailers offer an efficient method for companies to promote their products and cultivate robust customer relationships [5].

Numerous businesses have utilized the internet as an effective platform to evolve their conventional operations and transition into electronic enterprises, whether in full or in part. These organizations have enhanced their commercial endeavors, which encompass the buying and selling of goods and services, along with the optimization of production methods. By leveraging the internet, these companies can access new markets free from the constraints of borders or distances, resulting in greater profits, decreased expenses, quicker delivery times and improved customer accessibility [1].

1.1 Study Objectives

This study aims to achieve the following objectives:

1. Analyze the nature of e-commerce stores and understand the key characteristics of e-commerce stores compared to traditional stores, including the physical and intangible elements that make them up.
2. Understand the different types of e-commerce stores, such as physical stores, services, digital products, subscription models, and wholesale models, and examine the characteristics of each type.
3. Analyze the legal framework for e-commerce stores, including analyzing the effectiveness of current regulations governing them and identifying legal gaps that need to be addressed.
4. Identify the key differences between e-commerce stores and other online sites and how these differences affect the nature of commercial transactions and related rights and obligations.
5. Evaluate the rules for guarantees and protection of rights in e-commerce and make recommendations for improving them.
6. Analyze how consumers and merchants use e-commerce stores to save time and effort, expand their customer base, and reduce operating costs.
7. Examine the impact of the emergence of e-commerce stores on traditional commerce, including changes in buying and selling patterns, and assess their impact on the performance of traditional businesses.

1.2 Study Methodology

Employing a descriptive analytical method, this study aimed to thoroughly and accurately examine the phenomenon under investigation. It emphasized the legal dimensions associated with electronic stores and evaluated the existing data to formulate recommendations that could enhance legal frameworks and provide improved consumer protection.

2 Types of Electronic Stores

With technological advancement and the emergence of electronic stores as a new commercial means for concluding contracts, several types of these stores have emerged in various ways, which will be presented as follows:

2.1 Electronic Stores for Selling Products

The most prevalent and recognizable type of electronic store accounts for a significant portion of online retailers. In this model, the business owner sells products directly to customers without any intermediaries involved in the sales process. Shoppers can conveniently browse, compare, and purchase items from these stores from their own homes, thereby saving both time and effort. Examples of such electronic stores include those that specialize in clothing, cosmetics, and various other categories. A notable instance is Amazon, which started as a book retailer and subsequently broadened its offerings to encompass a wide range of products, including clothing, sports equipment, and cosmetics. This type of store operates without a physical storefront but utilizes warehouses to hold inventory until it is dispatched to customers' residences or shipping company locations.

2.2 Websites for Selling Services

The rise and broad acceptance of electronic stores, which consumers heavily depend on, has led to their expansion into service offerings. These services can be described as "direct actions designed to fulfill the needs and wants of consumers based on demand" [5]. Electronic stores provide various services, such as hotel bookings or flight reservations. The characteristics of these services differ; they may be completely non-material, like a request for a medical consultation, or they might offer a tangible benefit, such as transportation [6]. The objective of any service provided by electronic stores mirrors that of products: to fulfill the consumer's desires. For instance, the "Flyin" website offers flight ticket booking services across all classes, along with various deals. Similarly, "Google Flights" enables customers to search for flights at the best prices, among other features [7].

2.3 Electronic Stores for Selling Digital Products

Digital goods encompass all items that exist in a digital format, such as e-books, software, online courses, graphics, and downloadable products. Because these items do not necessitate physical storefronts or storage facilities, they can constitute a significant share of e-commerce transactions related to digital merchandise. This inherent digital characteristic results in reduced management costs compared to other product types, facilitating smoother operations and enabling sales to customers at the necessary quality for successful transactions. An illustration of this is the "Sellfy" platform, which facilitates the sale of various digital products, including music files and e-books [8].

2.4 Stores Operating on the Private Label Model

Merchants who possess ideas regarding product specifications or goods but lack the necessary funds or resources to establish dedicated manufacturing facilities typically utilize this approach. Consequently, these merchants must reach out to factories to manage both the design and production processes, which helps to lower the operational and logistical expenses associated with their stores. They subsequently offer these products through their online platforms. For online store owners, having a strong foundation in marketing is crucial in this scenario. They need to ensure that the products are thoroughly vetted, of superior quality, and effective before introducing them to consumers, thereby fostering trust and facilitating successful sales. Upon receiving the products from the factories, store owners have several options: they can either ship the items to their own warehouses, deliver them directly to the consumer, or send them to third parties, such as companies that then showcase and sell the products to consumers or other businesses [6].

2.5 Wholesale Stores

The process of wholesale involves selling products at prices that are lower than those found in the market. Wholesalers provide goods at reduced rates, typically to retailers, who then sell these items directly to consumers. Acting as intermediaries, wholesalers connect the factories that manufacture the products with the retailers. Their operations are specifically tailored to accommodate wholesale orders. Nevertheless, some wholesalers also sell directly to consumers, offering either standard market prices or wholesale prices, which means they are not restricted to retail sales alone. While certain wholesalers cater to both consumers and retailers, they may only extend wholesale pricing for bulk purchases, regardless of whether the buyers are consumers or retailers. This flexibility allows them to sell both large and small quantities. On a positive note, when retailers place substantial orders, wholesale store owners benefit from increased profits. Conversely, if retailers make large advance orders and subsequently cancel them, the wholesalers bear the consequences. Consequently, it is essential for them to obtain assurances by implementing penalties that can mitigate the risks wholesalers may encounter if a retailer fails to meet their obligations. For instance, “AliExpress” is regarded as a major marketplace featuring numerous high-quality items at wholesale rates, making it the top preference for retailers [8].

2.6 Subscription-Based Stores

Continuous operation serves as the cornerstone for this kind of store. A subscription fee, which can be paid weekly, monthly, or annually, is exchanged for the ongoing delivery of products or services. Customers who shop online often favor this model for items they receive regularly, as it alleviates the hassle of making repeated purchases that could lead to extra shipping fees [9]. Historically, the subscription model was primarily utilized by publishing companies to deliver magazines, newspapers, and books on a monthly basis to their dedicated clientele. While subscriptions were once mainly associated with the publishing sector, they are now widely employed to provide products and services to consumers in a convenient and efficient manner. Additionally, both consumers and store owners benefit from the opportunity to introduce new products to customers, which can enhance future purchases if the items resonate with them, ultimately boosting sales for the store while offering consumers new products tailored to their preferences [10].

3 Characteristics of the Online Store

The traditional store and the online store exhibit several similarities, focusing on the essence and nature of the store rather than the methods of operation or the quality of the products offered. Beyond these common traits, the online store has distinct features tailored to the technology and electronic means utilized in this format. One important characteristic is its classification as movable property [9], which most scholars concur on, asserting that a commercial entity should be viewed as movable property rather than real estate. This classification arises from the fact that all components, whether tangible or intangible, are entirely movable. None of the elements are fixed; goods, customers, industrial property rights and every other component are regarded as movable assets without exception [10].

3.1 Considering the Online Store as Movable Property

The classification of the online store as movable property arises from the inherent nature of its constituent elements. This store consists of both tangible and intangible components, all characterized by their movable nature. A key implication of designating the online store as movable property is its adherence to legal regulations that govern such assets. Unlike real estate, it cannot be mortgaged; however, it is eligible for a possessory lien and is regulated by the laws pertaining to possessory liens [11]. Consequently, most scholars concur that the commercial establishment should be viewed as intangible movable property, though they vary in their rationale for this

classification, particularly regarding the underlying reasons that define a commercial establishment as intangible movable property [12].

3.2 Considering the Online Store as Intangible Property

The online store is regarded as intangible property due to its lack of physical presence, making it imperceptible through the senses [13]. Its formation is built upon intangible components, rendering it impossible to recognize its existence or establish a commercial entity without the aspect of customer connection. Although it is possible for material components to be absent or reduced without undermining the status of the commercial establishment, the foundational element of customer connection is essential for envisioning a commercial entity [14]. All other intangible and tangible components exist to support this crucial element, which is categorized as an intangible element, thereby classifying it as intangible movable property [15].

While the online store includes both tangible and intangible components, it is classified as intangible movable property. It is important to highlight the significance of the intangible aspects, as outlined in Article (37/2) of Federal Decree-Law No. (50) of 2022 regarding Commercial Transactions Law: "The material elements are not considered essential in the commercial establishment, unlike the intangible elements, which are essential for the existence of the commercial establishment if one or more of these elements are present" [16]. The researchers assert that the intangible components forming the online store, such as the trademark and domain name, hold substantial importance, serving as the foundation of the online store. Given their lack of physical presence and inability to be sensed, the legal regulations applicable to tangible movables do not pertain to them. The online store is recognized as having a commercial character. For the online store to attain the status of a commercial store, all its components, both tangible and intangible, must be intended for commercial use. This utilization must be conducted in a professional manner for the online store to gain commercial recognition. An office belonging to a lawyer or a doctor, for instance, is not classified as a commercial establishment due to its lack of commercial character, even though it includes aspects of customer interaction. In contrast, an online store operates on different principles than those governing client relationships with professional offices; the connection in an online store is aimed at commercial gain rather than the personal qualities of the seller. This differs from professional fields, where clients seek engagement based on expertise, proficiency, and personal factors [17].

Certain academics contend that actions associated with professional fields qualify as civil activities and do not equate to a commercial establishment [18]. The commercial designation pertains to the store rather than the individual trader. A commercial establishment is recognized whenever a store is present for commercial purposes, and it is not essential for the store owner to possess trader status. Trader status is attained if the individual engages in the commercial activities outlined in Articles (6, 7) of the Jordanian Commercial Law. For example, a lawyer's office or a doctor's

clinic cannot be classified as a store. To validate an online store as a commercial establishment, the trader must engage in their commercial activities in a professional manner; if conducted in a casual manner, commercial status is not conferred [19]. According to Article (13) of the Jordanian Commercial Law, "A person who engages in a commercial transaction by chance is not considered a trader, but the mentioned transaction is subject to the provisions of the Commercial Law" [20].

3.3 Ease of Use

Ease of use is characterized as "the comfort of utilizing online stores and the straightforwardness devoid of any complications" [21]. It can also be described as "the level to which the design is simple and easy, enabling customers—particularly those who prefer to achieve their objectives directly—to accomplish their tasks swiftly and with minimal effort" [22]. Furthermore, it is defined as "the extent of customer satisfaction regarding their interactions with the online store, stemming from well-organized content, clarity in navigation, enjoyment in reading, and the smooth structuring of information that facilitates easy interaction" [23].

The relationship between ease of use and electronic trust is significant; a store that is simpler and more convenient to navigate is perceived as more trustworthy and reliable, which in turn enhances customer satisfaction. Elements that contribute to a store's user-friendliness encompass well-organized content, a straightforward purchasing procedure, multilingual support and round-the-clock availability. These factors collectively boost customer trust and broaden the customer base, resulting in a favorable effect on the store [24].

3.4 Electronic Payment

As transactions occur electronically, there is a necessity for electronic payment, which can be defined as "the process of transferring money, which is essentially the price of goods or services, in a digital way using computers and sending data over a telephone line, a network, or any data transmission method" [25]. This aspect is also recognized as a defining feature of online stores. With the growth of commerce via online platforms, the availability of electronic payment options, coupled with their essential link to security, plays a pivotal role in establishing trust and ensuring the success of the store. A store gains credibility for successfully completing purchase transactions; thus, there exists a connection between the security of electronic payments and the efficiency and fulfillment of purchases made through the online store. Conversely, an increase in fraud and security vulnerabilities leads to a decline in consumer willingness to shop and engage with these stores [26].

The significance of electronic payment to consumers cannot be overstated, as it optimizes both time and effort, leading to a rise in the adoption of this payment

method. This approach not only lowers the costs associated with transfers and purchases at any time but also enhances security when utilized as an alternative to cash [27]. The advantages of electronic payment—such as convenience, speed, safety, and the assurance of rights—are highlighted by the documentation of transactions within the records of the electronic payment provider and the acceleration of purchase completions, facilitating subsequent steps in product delivery or after-sales service. These features have proven beneficial for purchase transactions. Although some customers harbor concerns about the process due to potential security vulnerabilities in certain stores that may exploit customer data or fears regarding balance manipulation, some retailers have addressed these issues by offering a payment-on-delivery option, albeit at a higher price than what is displayed in the store, to incentivize customers toward electronic payment methods and maximize the advantages of this system [28]. The researchers characterize electronic payment as the mechanism through which financial rights are protected and the obligation to fulfill these rights is established between the two parties involved in a commercial transaction–the customer and the merchant–in exchange for an agreed-upon good or service, with this obligation being met by the authorized bank responsible for financial transfers [29, 30].

3.5 After-Sales Service

After-sales service is such a vital factor in cost reduction and increased profit that it could be a reason for perfection of the competition between online stores [31]. Achieving customer satisfaction is the critical element of creating a long-term, profitable relationship that eventually results in increased loyalty of customers and repeat purchase [29, 32].

If e-stores follow up the sale with the customers, they have several advantages coming in their way like it helps to get in a strong position with the customers at the time of initiating new con-tracts, retain customers for a longer duration and enhance knowledge about goods and services which are not fully known by the consumers [33, 34]. It also guides customers to best ways to use goods and services which, in turn, help maintain the store's reputation [30, 35].

After-sales service is defined as "a package of services that that customer receives from the seller after completing the product purchase, giving the merchant an opportunity to attain loyalty to the company and brand where the customer enjoys the services provided" [21].

This service is vital to a buyer's relationship with the store and post handling technical challenges, or inquiries after helping to install and guide on how to operate the product also allowing for returns of flawed or damaged items [31, 32, 36]. It is aimed at customer delight and creating a long-term relationship with the customer [33, 34]. And it included choices like getting refunds, exchanging products, and added guarantees on the purchase that would build trust in the consumer towards the store owners who feel comfortable and reassured during shopping, giving merchants

a way to further solidify this new bond. Its aim is to provoke in a client reiteration purchasing which will be useful for aggrandizement of fame of shop and broadening its consumer community [22, 35, 36].

4 Conclusion

E-commerce is considered to be one of the most important developments resulting from the digital revolution and has deep implications for different dimensions of the economy and business. This chapter investigated e-commerce through its legal nature by analyzing the already existing legislation and how much it is challenged. The investigation indicated that current laws in many countries, including Jordan, are striving to cope with rapid developments in e-commerce but are challenged on several fronts, among them being inflexible towards updating the legislation to cover technological advancements favoring personal data protection or putting in place effective mechanisms for dispute resolution. Besides, attention-attracting legal lacunae were discerned that call for regulating electronic transactions specially apart from extending proper legal protection toward consumers as well as ensuring transparency within online commercial transactions. It also confirmed that there should be a collaborative effort between legislative bodies together with regulatory bodies and businesses if they have to build on the existing legal frameworks for sustainability in e-commerce.

4.1 Findings

The study concluded with the following findings:

1. E-stores share a number of features that set them apart from traditional stores, offering both access to a vast global audience as well as an inexpensive and time-saving shopping experience.
2. E-commerce platforms have expanded to encompass a wide array of services and products, including retailers of physical goods, providers of services, and vendors focused on digital products and unique business models.
3. The study showed that there were legal lacunae in many countries regarding the regulation of e-stores. Some countries do not yet have defined specific laws governing this kind of trade, and thus the development of new legislation is needed to keep pace with the growth of e-commerce.
4. The research highlighted the essential differences in e-commerce stores and other websites that lead to varying commercial transactions and resulting rights and duties. This demands more attention on the part of consumers and merchants regarding their behavior with such platforms.

5. The research revealed that both warranty legislation and the rights of protection in electronic sales still need enhancement and revision to ensure the rights of both sellers and buyers.
6. It was found from the results that e-consumers save a lot in time, effort, and are benefited with access to several products/services.
7. The research proved that the appearance and expansion of e-stores have significantly changed procurement and sales patterns, as well as seriously harmed the performance of traditional businesses, which has pushed many firms to take electronic commerce as the major approach for their business development.

4.2 Recommendations

In light of the study's findings, the following recommendations can be made:

- Lawmakers from various nations should endeavor to revitalize and amend their e-commerce legislation so that such laws shall be deemed to apply to all electronic data transactions. This involves enacting, within those laws, specific rules governing the protection of consumer rights and protection of the interests of merchants, along with obligations for other parties.
- Consumer and merchant awareness campaigns regarding their rights and responsibilities in electronic transactions should be established. Such initiatives could address issues like warranty rights, return policies, and the protection of personal data.
- Robust systems need to be put in place to safeguard consumers against fraud or deceit in online shops, including the development of centralized platforms for lodging complaints and verifying the legitimacy of stores.
- Governments and e-store operators should work together more closely to ensure adherence to laws and regulations while promoting the sharing of information regarding illegal activities.
- It is essential to enhance the technical infrastructure needed for the advancement of e-commerce, which involves increasing access to high-speed internet, upgrading electronic payment systems, and advancing information security technologies.
- Encouraging innovation in e-commerce involves backing startups and small initiatives that present fresh and creative solutions within this sector. This support could be realized by offering tax incentives and ensuring that financing is easily accessible.
- The research suggests that additional studies should be carried out to explore how e-stores influence traditional markets, particularly their effects on conventional employment, consumer behavior, and the local economy.
- To foster trust between consumers and retailers in online transactions, it is crucial to implement quality standards for e-services, guarantee price transparency, and offer clear details regarding purchase and return policies.

- Universities and institutions should implement specialized educational and training programs in e-commerce to develop skilled professionals who can effectively manage this form of commerce.

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Educational Training and Its Policies in Saudi Arabia: Enhancing Technical Skills and Implementing Technology in Training Program Development



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Abstract This research seeks to assess and analyze the educational training framework in Saudi Arabia, concentrating on how effectively training programs contribute to the development of educational professionals. The methodology employed was descriptive in fulfilling the study's aims. Findings reveal that while there are evident initiatives to enhance educational training, there remains a necessity to further refine the training programs to better meet the practical requirements of those in the field. Additionally, the results underscore the significance of improving the quality of oversight for training programs and ensuring their ongoing implementation. Recommendations include boosting investment in the training of educators and consistently updating training programs to align with contemporary advancements in education. Furthermore, the study highlights the importance of providing increased support for educational professionals to ensure that training objectives are met efficiently and effectively.

Keywords Educational training · Educational professionals · Training programs · Education effectiveness · Educational supervision · Program updates · Professional development · Staff support

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1 Introduction

Given the substantial educational renaissance taking place in Saudi Arabia, education has emerged as a crucial pillar and an essential element in the pursuit of sustainable development within the nation [1, 2]. As the demand for improved educational quality rises, the significance of educational training has surfaced as a key factor in cultivating educational competencies and boosting the performance of the education system [3–5]. Today, educational training serves as an indispensable resource for preparing educators and supervisors, providing them with the essential skills and knowledge required to stay abreast of scientific and pedagogical advancements across different educational tiers [6–8].

This focus aligns with Saudi Arabia's Vision 2030, which prioritizes education as a key element for achieving holistic development. Aiming to elevate teachers' skills and enhance their competencies, Vision 2030 implements advanced training programs that support national objectives, such as refining the educational process and fostering a knowledge-driven society equipped to compete on a global scale. The Kingdom's advancements in science and technology center on boosting educational outcomes by strategically investing in human resources and equipping them with cutting-edge technologies and teaching methodologies [1, 9].

Currently, a notable transformation is occurring globally towards human development, emphasizing the necessity of training and development in numerous sectors, especially within education. Education is progressively recognized as a means to empower both individuals and communities by boosting their skills and enhancing their effectiveness [10]. As a result, educational training addresses the challenges encountered by the education sector on both local and international levels, playing a vital role in ensuring the sustainability of the educational process [2, 11].

In light of this, the study investigates several important aspects concerning the educational training system in Saudi Arabia. Among these are the definition and goals of educational training, the various types of training offered, and a thorough analysis of the training framework within the Kingdom. Furthermore, the study emphasizes the objectives and functions of the Educational Training and Scholarship Department, providing an overview of the educational training centers throughout Saudi Arabia and the overarching regulations that govern them. It also addresses the methods used to identify training needs within the Ministry of Education and how these needs are addressed to ensure the provision of effective training programs that enhance the education and professional growth of educators and supervisors.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Highlight the concept of educational training and its role in developing the skills of those working in the education sector.

- Analyze the educational training system in Saudi Arabia, identifying its main strengths and weaknesses.
- Analyze the role of the General Directorate of Educational Training and Scholarship in improving the educational process.
- Review the sources used by the Ministry of Education to determine training needs and how they are met.
- Propose practical recommendations to improve the effectiveness of training programs and increase educational efficiency in the Kingdom.

1.2 Methodology

The descriptive methodology is utilized in this study, making it suitable for the examination of educational phenomena and the analysis of educational systems. This method has been employed to outline and evaluate the educational training system in Saudi Arabia, as well as to assess its effectiveness in cultivating educational professionals.

2 The Concept of Educational Training

Educational training is a systematic way of increasing the skills and abilities of the individuals engaged in the teaching sector, increasing their wisdom, and awareness and behaviorally positive [12, 13]. It provides professionals in this sec-tor with knowledge and skills that are necessary to address various challenges in their careers productively [14, 15]. This is achieved through customized training programs that enhance professional growth and improve practical performance of participants in specialized training environments toward attaining optimal levels of competency and expertise in educational pursuits [3, 16, 17].

In the [4] study stressed that educational training helps to improve the skills and capabilities of educators which later results in higher performance quality of the output and improved educational process. This further enables the teachers to implement new technologies and recent findings more effectively in their teaching assignments. Moreover, according to [5], educational training is an informational activity aimed at improving knowledge, changing attitudes and developing skills of pedagogical workers to enable effective performance of their professional duties.

According to these definitions, the researchers argue that teacher training is the crucial process of improving the skills and competences of professionals in the field of education with an aim to better educators' performance and widen knowledge based on modern developments in education. Customized in its nature, these programs of educational training help participants tackle professional challenges thus making them fit for attaining high levels of standard competence and excellence in all educational pursuits. Additionally, it improves the quality of the educational process by

integrating contemporary techniques and knowledge, which in turn positively influences the effectiveness of education and facilitates the attainment of higher educational goals. Consequently, educational training is regarded as a fundamental instrument for enhancing performance and achieving superior results in the educational process.

Educational training focuses on three key aspects [6, 18, 19]

- **General educational aspect**: Enhances the educator's understanding and provides them with the necessary knowledge to interact with students.
- **Technical educational aspect**: Related to the educator's specific subject or field of expertise.
- **Professional educational aspect**: Focuses on equipping educators with the necessary professional skills.
- It is also worth noting that training programs designed to develop professionals in the educational field are characterized by four main features [7, 20]:
- Contribute to the effective development of individual skills while taking into account personal differences among school leaders.
- Help develop leadership skills, enabling them to lead effectively.
- Base programs on the vision, values and mission of the Ministry of Education.
- Focus on developing the skills and knowledge of educational professionals to achieve the long-term strategic goals of their institutions.

2.1 Objectives of Educational Training

According to [8], educational training aims to achieve several key objectives, including:

- Developing leadership skills in education and effectively using available resources.
- Improving the administrative and financial performance of educational institutions.
- Raising the level of teacher performance by developing their knowledge and skills.
- Helping teachers to gain new experiences and solve educational challenges.
- Guiding teachers to use modern and more effective teaching methods.
- Addressing weaknesses among teachers who do not have educational qualifications.
- Introducing teachers to the latest educational methods and promoting a positive work environment in schools.
- Improving individual performance and increasing productivity and efficiency in carrying out tasks.
- Developing the knowledge and skills of teachers to increase their professional performance.
- Strengthening the relationship between teachers and the educational institutions where they work

- Planning and developing the workforce to meet future needs.
- Improving the working environment to make it more conducive to productivity and comfort.
- Targeting various categories of educational professionals, including managers and supervisors, to ensure comprehensive improvements in the education system.

2.2 Types of Educational Training

According to [9], there are several types of educational training, including:

- **Applied Training**: This form of training is essential as it emphasizes the practical and realistic execution of everyday tasks undertaken by educators. The goal of applied training is to cultivate skills through opportunities that allow the application of acquired knowledge in actual work environments. It contributes to better job performance and boosts confidence in professional capabilities, empowering educators to hone their problem-solving and decision-making skills within real-life contexts. Continuous guidance and assessment of the trainee's activities in their daily professional situations are necessary for this type of training.
- **Cooperative Training**: Collaboration among trainees and teamwork are fundamental to cooperative training, which aims to accomplish projects or engage in joint training activities. The objective is to cultivate social skills essential for collaboration and to utilize learned knowledge in team-oriented contexts. This method improves communication abilities and fosters professional relationships, enabling educators to exchange ideas, address challenges, and propose solutions, ultimately resulting in thorough problem-solving and efficient teamwork [10, 21, 22].
- **Self-Directed Training**: Self Self-directed training mainly consists of educators engaging in independent learning without the presence of direct oversight. A lot of flexibility is allowed with this method of training, and learners can choose their own schedules and study locations. The activities may include reading literature, watching e-learning programs, and using digital resources. This approach helps trainees improve their skills and learn at their own pace, allowing them to choose the areas in which they want to develop their knowledge and specialization based on their experiential needs, giving them the freedom to choose from among areas that interest them [11, 23].
- **Online-based Training**: This kind involves the use of technology and online platforms to bring education activities and training content to far-off place. One major advantage of e-learning is that it saves time and effort, thus allowing trainees to take up training courses from almost any place at any time. It offers recorded lectures, virtual classrooms, and interactive assessments [24]. This helps make it a viable option for teachers who cannot attend regular training programs [12, 25].
- **Workshops**: Traditional training methods known as workshops emphasize direct, and interactive learning. The sessions are short and snappy with a laser-sharp focus on what is important, enabling the participants to immediately apply the

newly captured ideas through on-the-spot exercises or examples. Through an interactive environment, workshops promote specialization of knowledge and skills and engage trainers with trainees directly [13, 26].

- **Professional Learning Communities**: This modern training method emphasizes the development of collaborative teacher cohorts working together continuously towards improving the quality of education by sharing their experiences and ideas related to curriculum development, pedagogy, and student learning. Professional learning communities help in reviewing educational practices for enhancing academic achievement with sustain ability, continuous learning, and collective growth [14, 27].
- **Conferences**: Educators and specialists in the realm of education gather at conferences to explore the newest advancements, obstacles, and innovations in the field. These events serve as a venue for sharing ideas and experiences while gaining insights from recent research and studies [28]. By learning from the experiences of others, participants can enhance their knowledge and establish professional connections. Despite being viewed as conventional, conferences continue to be a valuable method for knowledge transfer, professional growth, and learning [15, 29].
- **Comprehensive Training (Multimodal)**: A variety of training methods are utilized in comprehensive training to attain optimal results. This method integrates both theoretical and practical activities, alongside cooperative training, self-directed learning, and e-learning, to create a holistic training experience [30]. By taking into account the unique differences among trainees, comprehensive training enhances essential competencies and practical skills. It provides a broad spectrum of learning techniques and guarantees that all necessary components for skill development are addressed [16, 31].

3 Educational Training System in Saudi Arabia

The educational policy of Saudi Arabia prioritizes educational training, considering it essential for continuous advancement within the education sector. The purpose of this training is to improve both the academic and behavioral performance of individuals involved in education by offering new experiences and refining their skills. The Ministry of Education delineates several legislative articles concerning educational training [17]:

- **Article 165**: It focuses on preparing qualified teachers academically and behaviorally for all stages of education in order to achieve self-sufficiency according to a specified schedule.
- **Article 170**: It emphasizes that training is a continuous process aimed at improving the skills of underqualified persons and updating their information and experience.
- **Article 172**: It enables teachers to pursue higher education in their specialization, with the necessary provisions to facilitate this.

- **Article 196**: It emphasizes the importance of training and refresher courses to enrich experience and acquire new skills and information.
- **Article 197**: It provides that training should cover all aspects of the educational process, including defining course objectives, curricula, implementation methods and assessment.
- **Article 198**: It requires that awareness courses be conducted after the approval of any curriculum, with specific objectives and implementation methods with the participation of curriculum developers, educational supervisors and teachers.

After examining the legislative documents concerning educational training in Saudi Arabia, it is clear that significant initiatives are underway to improve and advance the educational system through structured and sustainable training programs. Recognized as an essential instrument for enhancing educational quality, educational training is emphasized within these texts [12]. They acknowledge the necessity of elevating the skills of both teachers and supervisors. The system strives to achieve a balance between scientifically and behaviorally equipping educators while consistently refreshing their knowledge. This demonstrates a strong dedication to delivering exceptional education that is in line with the most recent advancements in the educational sector.

3.1 Educational Training and Scholarship Administration in Saudi Arabia

Established in 1972, the Educational Training and Scholarship Administration in Saudi Arabia underwent a significant change in 2001 when it merged with the Guidance Administration, adopting the title "General Administration of Guidance and Training." [1] However, that very same year, a decision was made to divide Guidance from Training, leading to the formation of a new independent administration known as the "General Administration of Training and Scholarships." Furthermore, various educational administrations saw the establishment of training centers, and the Educational Training and Scholarship Administration was launched in the Riyadh region in 2008 [18].

The Educational Training and Scholarship Administration is dedicated to improving the skills and abilities of individuals within the educational sector, which in turn enhances their performance and efficiency, positively impacting the overall quality of education [16]. By delivering high-quality training services, the administration seeks to make strides in educational training and play a role in transforming society into a knowledge-driven community. Additionally, it prioritizes the integration of modern technology to address the needs of those in education while upholding core values that resonate with Saudi society, such as integrity, responsibility, justice, and excellence [19].

The administration seeks to achieve several main objectives, as outlined by [20]:

- **Enhance professional development**: Improve the skills and competencies of employees through professional development.
- **Train the national workforce**: Develop trained national staff to meet the needs of the ministry, improve educational outcomes, and increase productivity through continuous training.
- **Strengthen interpersonal relationships**: Foster positive interpersonal relationships and work attitudes among employees.
- **Practical application**: Train employees to apply practical ideas and solutions to bridge the gap between theory and practice.
- **Improve trainer effectiveness**: Increase trainer capacity through specialized training programs.

3.2 Educational Training Centers in Saudi Arabia

The initiation of educational training centers in Saudi Arabia took place after the issuance of Ministerial Decision No. 4105/42 in 1996, which mandated the establishment of independent training facilities for teachers in partnership with teacher colleges and other educational entities. These centers were provided with human resources, financial backing, and advanced technologies to offer short-term educational training courses for those in educational roles. As time has progressed, the Kingdom's educational training centers have evolved, with numerous independent facilities now featuring cutting-edge technologies. The General Administration of Training and Scholarships has bolstered these centers through a range of initiatives, as noted by [21]:

- **Expansion of training centers**: Establishment of training centers in all educational regions and governorates, including expansion of branch centers to provide training opportunities in remote schools.
- **Support plans and programs**: Providing necessary plans and programs to support the professional development of people employed in the education sector.
- **Qualified personnel**: Supporting these centers with qualified personnel and organizing the tasks of supervisors and the administrative structure.
- **Dedicated budget**: Allocating a budget to support professional training and implementing various training programs.
- **Interaction with the community**: Strengthening interaction with the local community by offering training programs on social topics and computer applications.
- **Database creation**: Creation of a database related to the development of educational thought to provide necessary information.
- The objectives of the educational training centers in the Ministry of Education in Saudi Arabia, as noted by [22], are summarized as:
- **Updating knowledge and skills**: Provide trainees with new knowledge and skills to help them improve their performance while staying current with scientific and technical advances.

- **Preparing a skilled workforce**: Equip teachers and supervisors to effectively perform their educational roles.
- **Retraining for new roles**: Offer training programs for those seeking new educational positions.
- **Improving professional relationships**: Improve professional and interpersonal relationships in the workplace and fostering positive attitudes toward the profession.
- **Solving educational challenges**: Research the issues affecting education and designing training programs to help solve them.

3.3 General Regulations for Educational Training in Saudi Arabia

In Saudi Arabia, the Ministry of Human Resources and Social Development [23] has established various overarching regulations that govern educational training, aimed at ensuring its effectiveness and alignment with the needs of professional development. These regulations encompass [32, 33]:

- **Program Significance**: Training programs must be directly related to employees' current or future job roles to ensure maximum career benefits.
- **Training Needs Assessment**: Government agencies are responsible for developing executive training programs, management training programs, and professional certifications to meet employee needs before they are included in scholarship plans.
- **Training Needs and Performance Assessment**: Training plans should be based on an assessment of employee training needs and performance, in accordance with the skill requirements specified in the Saudi United Classification Guide.
- **Annual Training Plan**: An approved annual training plan, including a budget, should be prepared. Employees should not be enrolled in training programs they have previously attended unless there are significant changes in content or level.
- **Program Standards**: Training programs and trainers must be licensed, and health-related programs should be accredited by the Saudi Commission for Health Specialties.
- **Criteria for Selecting Training Providers**: Ensure that training providers in Saudi Arabia are licensed by the relevant authorities and those outside the Kingdom are licensed by official bodies in their home countries.

3.4 Sources for Identifying Training Needs in the Ministry of Education

The Ministry of Education in Saudi Arabia relies on several key sources for identifying training needs within its training departments. These sources include [25]:

- Training supervisors are responsible for coordinating and implementing training programs, providing comprehensive training needs assessments based on daily and practical experiences.
- Educational supervisors offer insight into performance gaps based on direct interactions with teachers and students, identifying areas requiring training.
- Direct supervisors provide accurate assessments of individual performance and identify training needs based on practical experiences and daily challenges.
- Training Consultants offer specialized advice and recommendations based on their training expertise, helping to inform best practices and training methods.
- Senior Management develops overall training strategies and policies, establishing training needs based on strategic goals.
- Specialized training centers provide in-depth training programs in specific areas, offering specialized training to meet specific institutional needs.
- Trainees offer feedback on the effectiveness of training programs and their personal experiences, helping to improve programs based on practical feedback.

4 Conclusion

This study underlines the importance of the Saudi Arabian educational training sector as an integral part of efforts to improve education and train educational staff. An analysis of the goals of the system and different training alternatives shows that such programs play a very important role in equipping teachers and supervisors with knowledge and skills that help them raise educational standards in light of Saudi Vision 2030. The focus on training and development by the Kingdom shows very strong support for capacity building, while also utilizing new ways of imparting quality education for progress which is sustainable. Additionally, the improvement of training centers and their administration plays a key role in establishing a nurturing educational atmosphere that addresses the genuine needs of educators and supervisors. Consequently, the study advocates for the ongoing advancement of educational training initiatives and the enhancement of trainer quality and available resources to ensure the attainment of the desired outcomes and to cultivate an exceptional educational generation capable of confronting future challenges.

4.1 Study Findings

The study reached the following findings:

- Educational training is an important tool for developing educational staff and increasing their competences in line with changes in the field of education.
- The Kingdom of Saudi Arabia relies on various types of training, such as applied, collaborative and electronic training, which increase the variety of methods to improve teachers' performance.
- Training centers located throughout the Kingdom play a significant role in improving the quality of education by offering specialized training programs.
- There is an urgent need to identify training needs based on the analysis of results and provide specialized programs that meet these needs.
- Educational training programs are in line with the goals of Saudi Vision 2030, which aims to improve the quality of education and develop human resources.

4.2 Recommendations

Based on the previous findings, the study offers the following recommendations:

- Expand the use of e-learning and digital resources to enable teachers to access training content more flexibly.
- Design training programs that meet the real needs of those working in education, with a focus on practical training and leadership skills.
- Encourage cooperation between educational institutions and training centers to improve the effectiveness of training programs and ensure the quality of training.
- Emphasize the importance of ongoing training programs throughout the year to ensure the continuous development of educational staff.
- Improve mechanisms for periodic evaluation of training programs to ensure the achievement of goals and increase program effectiveness.

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Digital Divide and Social Inequality: An Anthropological Perspective on Technology Access



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Abstract This chapter examines the digital divide as a fundamental aspect of social inequality, particularly evident in developed Western countries like the United States. The unequal availability of information and communication technologies exacerbates existing disparities related to race, class, and gender. Individuals with access to technology reap economic benefits (both as producers and consumers), social advantages (through networks formed or sustained via ICT), and cultural enrichment (through information and experiences facilitated by ICT). Conversely, those lacking technology face tangible disadvantages due to this lost potential, compounding their marginalization. The qualitative methodology utilized in this study, which combines descriptive and analytical elements, offers an anthropological lens on the dimensions shaped by technology access within human social frameworks following an exploration of the digital divide's effects. Key findings indicate that gender-related issues are intertwined with broader inequalities that require intervention—gender-equitable strategies are essential for achieving universal technology access. Furthermore, the chapter advocates for recognizing technology access as a fundamental right in contemporary society, akin to essential resources like clean water. This research sheds light on how digital inclusion can bolster social sustainability and foster organizational creativity, underscoring the necessity for further investigation in this field.

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Keywords Digital divide · Social inequality · Technology access · Gender-sensitive policies · Anthropological analysis · Information and communication technologies (ICTs) · Digital inclusion · Social sustainability · Organizational innovation

1 Introduction

This chapter examines the ongoing digital divide as a contributor to rising social inequality. While information and communication technologies are becoming increasingly significant in Western nations, particularly in the USA, access to these technologies remains highly unequal, often reflecting disparities related to race, class, and gender [1]. The magnitude of this digital divide varies across Western countries and does not yield identical effects for each nation. Nonetheless, studies indicate that individuals who utilize these technologies experience economic, cultural, and social advantages. For numerous individuals, being excluded from emerging technologies leads to tangible repercussions [2].

Over the last ten years, technology has woven itself into the fabric of our culture, influencing various facets of daily life and carrying significant symbolic weight. This implies that the relevance of technology is shaped by cultural values and beliefs, extending beyond its practical applications, which in turn influences technological decision-making [2]. The implications and risks associated with emerging technologies now pertain to all individuals within modern society, rather than just a select group of experts. This chapter will also outline policy strategies designed to enhance technology access for those who remain offline. Policies addressing the digital divide should align with initiatives promoting gender equality; failing to do so could inadvertently exacerbate the marginalization of women in senior positions [3]. The chapter aims to demonstrate that gender-sensitive approaches can coexist with a model of open job competition. This is a critical matter, intertwined with both social sustainability and the efficacy of organizational innovation. Indeed, the advancement of opportunities through new digital services relies on their broad acknowledgment and initial development by women, as the user market is predominantly less male.

1.1 Research Significance

This research plays a crucial role in examining the digital divide and its effects on social inequality, focusing on the unequal access to technology that further exacerbates discrimination based on race, class, and gender. As technology increasingly permeates modern culture and society, individuals lacking access are likely to face significant disadvantages, not just economically but also in terms of cultural and social marginalization. An anthropological perspective enables a deeper investigation into how various social groups engage with technology and the systemic obstacles

they encounter. By emphasizing both the symbolic and practical aspects of technology in creating opportunities, this study contributes to ongoing discussions about social justice and digital inclusion. It navigates through policies designed to close the digital gap while promoting gender equality, offering critical insights into how equitable access to technology can foster economic growth and social cohesion. By advocating for gender-sensitive strategies that ensure women's active participation in high-level digital sectors, this research challenges traditional models of job competition and organizational innovation. Ultimately, it provides a long-term perspective on the societal impacts of digital inequality, along with policy suggestions aimed at cultivating inclusive digital economies.

1.2 Methodology

This study employs a qualitative methodology to investigate the digital divide and its repercussions on social inequality through an anthropological lens. The approach is descriptive, focusing on a review of existing literature related to technology access, emphasizing variables such as race, class, and gender that shape the digital divide. The literature review encompasses both historical and contemporary sources that explore the social, economic, and cultural ramifications of unequal access to digital technologies across various social groups. In addition to its descriptive nature, the research integrates an analytical aspect to evaluate the impact of these disparities on social structures and individual opportunities. This analysis will bring to light trends and challenges associated with technology access while critically examining policies and strategies designed to bridge the gap. By synthesizing the findings from the literature and exploring broader societal implications, this research aims to enhance the understanding of the relationship between technology access and social inequality and to suggest meaningful policy interventions.

2 Defining the Digital Divide

Since the early 1990s, a range of scholars from disciplines such as sociology, international relations, communication studies, and information systems have engaged in discussions regarding the implications and meaning of the digital divide [4]. This divide is generally categorized into two main types based on geographic location: rural versus urban. These categories highlight specific deficits in access, namely service availability compared to technological infrastructure. Additionally, there is a growing body of literature that explores the usage experiences associated with physical hardware. This means that social scientists not only analyze access to digital and electronic devices in varied ways, but they also place significant emphasis on differing levels of skills and the use of digital technologies as an area of interest in its

own right [5]. The varying terms and concepts employed in these definitions of the digital divide illustrate the complexities involved in conceptually framing the divide.

The digital divide can thus be characterized as a disparity manifested through three interrelated aspects—access, skill, and usage—stemming from geographic, social, and/or economic inequalities [6]. Additionally, varying levels of digital access suggest that individuals possess differing capabilities to acquire and utilize digital resources, which may aid in addressing social and economic challenges. Moreover, because intricate dialectical relationships and transitions exist between concepts such as access and usage, as well as skill and poverty, this characterization necessitates the application of diverse conceptual frameworks. New theories concerning digital inequality have emerged in the literature, closely tied to these features of the digital divide. A significant concept in this context is that of the public sphere [7]. Through digital mediation, new public spheres can emerge both within and between major public domains, facilitated by digital platforms that represent marginalized or disenfranchised groups. At the same time, transnational networks of these "other voices" leverage new communication technologies for collective action and political influence [8]. However, not all individuals can engage equally in these emerging global political discussions. The domination of new media by a select few reflects the structural inequalities prevalent in society as a whole.

The digital divide can be examined through a variety of theoretical lenses. This section explores several conceptual frameworks that serve to analyze the reasons behind varying levels of access to technology among individuals [9]. Numerous frameworks have been introduced to clarify digital inequalities and identify which groups experience reduced access to information technology [10, 11]. The following theoretical discussion is dedicated to investigating these frameworks as they relate to research on the digital divide [12–14]. This assortment of theories and models is regarded as distinct analytical instruments, each capable of dissecting specific elements of unequal access to and utilization of technology across different social settings, both locally and globally [15, 16].

The digital divide serves not only to categorize individuals who lack connection to the wired world but also reflects a process of social inequality [15, 17]. A growing body of interconnected studies in computation, sociology, and policy indicates an increasing recognition of the digital divide as a significant social issue [12, 18, 19]. Interestingly, while emerging technologies may contribute to the continuation of social disparities, they can also present opportunities that foster cultural revitalization and progress among marginalized communities [20, 21]. The perception of the digital divide has evolved; it is no longer viewed solely as a telecommunications policy concern, where those unconnected exist between the "haves" and "have-nots" [13]. Instead, it is recognized as a wider social phenomenon that intersects with numerous facets of everyday life [22, 23]. Social informatics has long highlighted the critical role of social and cultural contexts in influencing technology utilization and information accessibility, as well as how communities establish technical norms, practices, and understandings regarding new communication and computing technologies [24, 25]. By integrating anthropology with informatics, we gain a framework

to evaluate how culture, social norms, and personal identity influence communities of interest and their information usage [14, 26, 27].

3 Historical Context of Technology Access

The historical foundations of our media and communication technologies run deep, evolving from minimal scales (such as cities or villages) through national dimensions marked by time and telegraph, to the global networks initiated by the telecommunications revolution, and extending into the rural realm of the Internet and current discussions [15, 28, 29]. The characteristics of technological tools can be defined by the types, mediums, and velocities of communication they provide, as well as by their intensity, density, and the continuity of interactions [30, 31]. These tools and the media of communication, serving as cultural arenas for interaction, have always transcended the mere technical means employed [32, 33].

Digital communication on the Internet was initially limited not just to early adopters but also to those with technical advantages [27, 34]. Prior to the advent of digital communication, accessing Europe's national broadcasting systems was a matter of technical "privilege," which meant having a television or radio [16, 35]. During the interwar period and in both spheres following World War II, the ability to transmit messages enabled surveillance over both the senders and receivers of those messages. Strict regulation of radio access allowed political elites, whether communist or democratic, along with various lobbies, to maintain control [17, 36]. The Cold War period saw the emergence of covert, secret, and top-secret messaging systems within international politics, organized through secure and technologically advanced diplomatic channels. The televised Nixon-Kennedy debate showcased "images of personalities" [11, 34]. Just fifty years ago, television was considered an "immature" medium, dominated by talking heads and characterized by "unfiltered, unedited direct access" to journalists [5, 12, 35]. With the introduction of digital communication and social media to the public sphere, the rapid digitization of culture—encompassing areas such as digital banking, shopping, political campaigns, fake news, wars, copyright laws, and education—has been evaluated through the lens of "access" to computers and the Internet. For over sixty years, media systems and technological communication have served as indicators and influences of social structure, becoming integral to the manifest coding of social institutions and categories [3, 36]. This principle also applies to the Internet and e-applications, which we must view as a flow of content, individuals, services, and information.

4 Anthropological Approaches to Studying Technology Use and Access

This chapter contends, in accordance with anthropological perspectives, that various methodological strategies offer a unique viewpoint on the utilization and accessibility of technology [18, 37]. Qualitative research will yield comprehensive data, as interview surveys create a rich context that elucidates intentions, practices, and outcomes related to technology. Further layers of ethnographic insight are revealed through thorough visual analysis, which includes unpublished and obscure figure sentences [22, 38, 39]. Research in this domain has also challenged conventional metrics, indicating that the uneven distribution of technology-themed tools in relatively few instances raises doubts [40]. An anthropological perspective on technology and cultural practices enriches traditional teleological studies that emphasize the capabilities of technology, activities, and applications [19]. To grasp the variations in technological practices across different levels, anthropological studies illustrate digital marginalization and deprivation while underscoring 'disaffection' or non-use in contrast to the technological motivations of formally disadvantaged individuals [39]. The interplay between community and identity, and technology practices and applications, is one of maximization. Investigations into individuals and communities that hold positive values regarding alternative practices, agency, collective identity, and technology reveal that digital diversity does not simply arise from low self-esteem or limited purchasing power. Finally, 'relationship cultural materialism' emphasized in any anthropological examination of culture and materialism seeks to understand the essence of technology without imposing an exhaustive normative interpretation regarding what it is and its potential applications [39]. Our engagement with a network of smaller innovations, each emphasizing its unique cultural semantics instead of merely serving the needs of the 'worse off, ' places a premium on cultural and technical expertise [40].

5 Conclusion

In summary, reducing the digital divide to merely gaps in access and skills fails to acknowledge the profound connections between digital inequality and wider social disparities. This reductionist view simplifies a complex issue, treating access, skills, and technology usage as mere opposites. By concentrating solely on technology use, it obscures the underlying social inequalities, making them less visible. Furthermore, it is unethical to detach from individuals' real-life experiences with technology, especially when technology permeates our daily existence and regular access to digital tools can enhance opportunities for healthcare, education, and employment. In our technologically reliant societies, equitable access to these essential resources is undoubtedly akin to basic rights such as clean air and water, or the absence of fear from persecution. Just as open access to clean water is recognized as a fundamental

right framed within a context familiar to the Western world, we must consider how we can envision and implement access to technology and the wealth of information it provides. What implications arise when comparing access to a fiber optic cable with that of a water pipe, given the advancements and opportunities for knowledge each can deliver? To tackle these inquiries through the lens of how individuals interact with technology necessitates a comprehensive perspective on their lives and surroundings, especially as it can illuminate our own marginal positions. Consequently, for the reasons discussed, it is essential for researchers to persist in their efforts to gather and provide evidence regarding the intricate dynamics of digital inclusion and exclusion, which are vital for public dialogue and policy formulation.

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JFO-HMSA RPL: A Hybrid Energy Efficient Routing Protocol for IoT using the Jellyfish Optimization Algorithm



Kannan Shanmugam, Xavier Suresh, R. Ganeshan, Ashraf Shaqadan, and Ahmed Abdou

Abstract One of the most commonly used Internet of Things (IoT) wireless technologies for sensor communication is the routing protocol for low-power and lossy networks (RPLs). The importance of an energy-efficient protocol for routing in facilitating environmental data transmission between linked objects is another key consideration. Power loss during data transmission is one of the biggest problems facing the IoT. As the IoT relies on devices that have limited resources, achieving minimum energy consumption is a crucial goal. However, there are issues with energy conservation because of the IoT devices' limited resources and low computational capacity. In this study, an advanced and trustworthy energy-efficient solution for IOT-RPL is attained through the application of a jellyfish-based optimization technique. This study introduced the jellyfish algorithm for selecting cluster heads and the Heuristic

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Moth Search Algorithm (HMSA) for determining the most effective routes for data transmission while minimizing energy consumption. This method keeps the energy efficiency of the IoT intact while avoiding congestion with lower assured delays.

Keywords Energy efficient · IoT · Jellyfish · HMSA · Technological progress

1 Introduction

The Internet of Things (IoT) is now fundamental to human existence. It is one of the emerging technologies of the modern period that has piqued the curiosity of researchers and businesspeople alike [1]. The Internet is the primary method of communication for all IoT gadgets. The IoT is a network of interconnected computing devices that can exchange data also coordinate their actions without any human intervention. Smart homes, smart cities, smart health care, and smart agriculture are just few of the possible Internet of Things applications. A Wireless Sensor Network (WSN) is a system where a large number of devices in different locations may work together wirelessly to monitor a given area and report any anomalies back to a central hub. Sensor nodes are nodes in a network that can collect, process, and transmit sensor data to other nodes. Design challenges for the WSN arise from factors including the required number of sensor nodes, the layout of the network, and the required energy output. Energy efficiency is crucial in constrained networks, and optimum routing plays a critical role in this area [1].

To improve LLN performance, the RPL routing protocol (which stands for "routing protocol for low-power and lossy networks") appears to be the most popular option. developed a novel RPL goal function that attempts to extend the network's lifetime by simulating the battery consumption of nodes. Using a large-scale simulated network, we assess the effectiveness of using the residual energy of individual nodes. Developed a new additive RPL metric that compromises between node delay, connection dependability, and energy consumption [2]. It has been demonstrated that reducing congestion and latency can be achieved by improving the reliability of pathways to the sink. In, we present a new PRL composite metric that incorporates delay, hop count, connection quality, and the number of expected transmissions (ETX) [3].

The current research is centered on two crucial aspects of Internet of Things networks: the efficiency with which energy is used and the transfer rates that can be achieved in a network with a large and heavy dynamic load [4].

Recently, Routing Protocol for Low-Power and Lossy Networks (RPLs), which are based on the Internet of Things (IoT), have opened up a new and intriguing arena for the creation of new kinds of applications. This field has the potential to revolutionize a variety of industries [5]. RPLs are constructed out of a number of smaller sensing nodes, each of which is responsible for monitoring its immediate environment, performing data analysis (if required), and communicating with and receiving data from those other sensing nodes [6]. These sensing nodes, which are dispersed across the environment, are connected over a network either to a sink node,

which is used in networks with centralized data collection, or to other sensing nodes [7]. The sink is responsible for the collection of sensor data in centralized networks for the usage of end users [8]. In particular circumstances, the sink is also able to activate sensor nodes by sending network pol to those nodes [3].

There has been a reduction in network size due to cluster-based hierarchical routing algorithms [9]. The choice of the best cluster head takes into account four primary criteria, including the distance between the neighbour node and the central CH as well as the remaining energy distance in between two. In order to locate the best CHs, a recently developed efficient approach for choosing cluster heads and putting forward a WSN protocol that is both consistent and efficient with its use of energy [10]. The paper's most significant contribution is as follows:

1. For the IoT, we developed a low-latency, high-throughput, energy-efficient Heuristic Moth Search Algorithm (HMSA) to find the fastest possible path for data packets while using the fewest amount of resources.
2. Second, we created a jellyfish optimization algorithm that takes into account residual energy, the range between sensor nodes, and the quality of the links between them all to find the best possible cluster size and CH.
3. Third, the proposed technique using RPL in IoT successfully discovers the optimal path selection for routing methodology. In the end, numerical data prove that the proposed system is more effective and has a higher capacity than the existing approaches.

2 Related Work

Increased energy efficiency thanks to a routing protocol proposed [6] results in a longer lifespan for the sensors. In the proposed work, we apply the Dual-Prediction Mechanism from the Energy Efficient Routing Protocol using Dual Prediction Model (EERP-DPM) to the field of healthcare IoT [11]. If the predictions match the readings, or if the data are deemed critical because they exceed the upper/lower limits of defined thresholds, then less data will be transmitted between the sensor nodes and the medical server [12]. MATLAB was used throughout the design and testing of the proposed system, which was then deployed on the "MySignals HW V2" hardware platform [13, 14]. In comparison to other existing routing protocols, the proposed EERP-DPM protocol has been seen to be very successful in both simulation and experimental settings [15–17]. This is true not only in terms of energy consumption and network lifetime but also in terms of guaranteeing reliability, throughput, and end-to-end delay [6, 14, 18–20].

With the proposed EERP-DPM methodology for healthcare leveraging the IoT, sensor nodes can forego sending their sensed data to the medical server if the forecasts are in line with the actual readings [15, 16, 21, 22]. The MATLAB program and the MySignals HW V2 hardware platform were used in the creation and validation of the proposed system [23–26]. We examine the effectiveness of the proposed EERP-DPM scheme with respect to five performance indicators: network lifetime, residual

energy, throughput, path-loss, and end-to-end delay. With these five metrics in mind, we compared the modeling and experimental findings of our proposed EERP-DPM system against those of two other routing protocols. Numerical evidence demonstrates that the proposed EERP-DPM protocol enhances sensor node energy efficiency, extends network lifetime, and ensures delivery ratio in addition to wireless connectivity and reliability [27–29].

In a WSN-based IoT setting, the proposed NSSROP evenly distributes the load across all of the nodes [30, 31]. The DSR and OLSR serve as the foundation for the NSSROP, which adds a novel scoring method for path selection [32–34]. Each node's density is represented by a score that takes into account the node's energy and CNs [35, 36]. The blacklisting technique is also described to handle nodes in the WSN that are not cooperating [37]. Average energy usage, throughput, and end-to-end delay were all dramatically reduced by the NSSROP in the trial [38, 39]. Results from simulations reveal that the suggested method outperforms various tried-and-tested protocols [40] point out the following constraints in secure data communication with IoT.

- Communicating and collecting data while adhering to delay limits is essential in smart metering applications.
- Due to limited resources, IoT devices necessitate a trustworthy and power-efficient routing protocol.
- In addition, packet loss and congestion are common results of metrics being used in lossy networks.
- Low latency and low energy consumption are typically the primary system targets in smart grid communication.

In light of these limitations, the authors suggest improving RPL to guarantee both link stability and low latency [41]. Delay-Aware RPL is an alternative name for the suggested procedure (DA-RPL) [42]. This paper also includes the algorithm for placing repeaters to achieve the desired latency. Performance of a realistic simulated RF network is measured and analyzed [43]. The experimental results demonstrate that DA-RPL has a promising performance in terms of latency and power consumption [44]. To keep the end-to-end delay of the network's nodes below a certain level, the researchers developed a new routing metric called DA-RPL, which prioritizes routes with lower latency and fewer bottlenecks [44, 45].

3 Problem Statement

These days, when people think of the Internet of Things (IoT), they usually picture a vast network of interconnected devices working together to collect and relay data on their intended subjects [46, 47]. Due to the potentially hostile environments in which nodes may be located, it is crucial that they be able to transmit data securely [48, 49]. Therefore, IoT applications should absolutely require a dynamic routing path [50]. While doing so, the nodes can be subject to malicious assaults that result in the

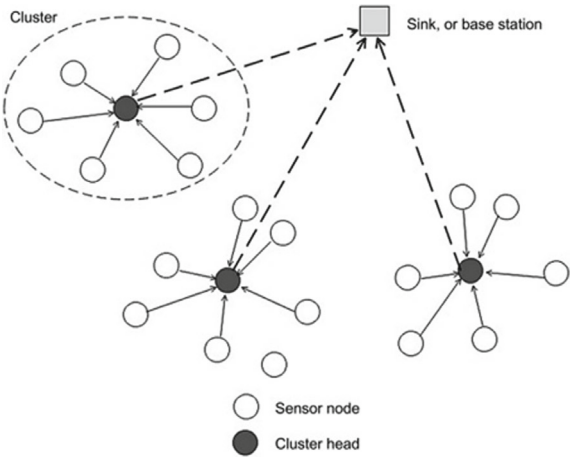


Fig. 1 Cluster head formation in IoT

problem of black hole, which has repercussions for the network's throughput, packet delivery rate, and overall efficiency [51]. Energy efficiency is another key issue with the Internet of Things. Unfortunately, the aforesaid issue cannot be solved by using the results from the aforementioned efforts. In order to solve the aforementioned issue, a Heuristic Hybrid Moth Search Algorithm is developed, with the selection of the cluster head (CH) as its heuristic basis [52] (Fig. 1).

3.1 Jellyfish Optimization for Cluster Head Selection

Communication and network overhead are a bottleneck for energy-aware RPLs. Traffic on a network often uses many protocols at once, while both the number of nodes and the overall size of the network continue to grow [53]. As the number of network rounds grows, there is also an increase in communication overhead. Multiple academics have developed optimization-based CH selection methods as a solution to these problems. Many CH selection techniques suffer from the inability to quickly converge on the optimal CH for the cluster. Furthermore, in certain algorithms, determining the best CH for cluster-wide information sharing might be challenging. As a result, nodes in an IoT network tend to fail quickly. Therefore, this research presents JFO (Jelly Fish Optimization) for choosing CH in RPL to address the aforementioned issues [53].

A CH may be chosen using the Jellyfish protocol, a clustering routing mechanism (CH). The communication protocol for sensor nodes is strictly limited to CH. Jellyfish optimization's goal is to minimize network power consumption and maintenance costs over time.

Nodes in JFO-RPL are dispersed arbitrarily over the network topology. There is one DODAG root node and 200 nodes in this network. There is one jellyfish (JF)

for every node in the graph, therefore, JF = (JF1, JF2,… JFn). First, we use the Euclidean Distance to form a cluster (ED). After that, JFO is utilised to zero in on the optimal CH node.

Creating a virtual cluster, choosing a CH, and establishing a route are the three main phases of JFO-RPL. Each node in the network is assigned a cluster based on its distance from each other, calculated using the Euclidean distance. Selecting the CH node in the cluster uses JFO. RER is used for route establishment. In DODAG, information from a node is sent up to the central hub.

3.1.1 Formation of Clusters

For the cluster formation Euclidean Distance is calculated among the nodes. Nodes are distributed randomly in the network. Nodes are initiated with the coordinates (m_i, n_j) the distance between two nodes (m_1, n_1) and (m_2,n_2) is calculated by using

$$D = \sqrt{(m_1 - m_2)^2 + (n_1 - n_2)^2} \tag{1}$$

The Euclidean distance is used to figure out the distance "D" between one node and all the other nodes. Its formula is given in

$$D_{i,j} = \sum_{i=1}^{x} \sum_{j=1}^{y} \sqrt{(m_i - m_j)^2 + (n_i - n_j)^2} \tag{2}$$

The distance $D_{i,j}$ between the cluster center and a node's coordinates is less than or equal to the distance plus or minus the distance from the previous iteration $D_{i,j}$ $D_{i-1,j-1}$. The equation shows how to figure out where the center of the cluster is between two nodes (3). We use the same method for all of the nodes.

$$\text{Centroid } (m_i, n_i), (m_j, n_j) = \left(\frac{(m_i + m_j)}{2}, \frac{(n_i + n_j)}{2} \right) \tag{3}$$

Algorithm for cluster formation

Step 1: initiate network with N number of nodes
Step 2: Calculate the Euclidean Distance between two nodes m, n using Eq. (1)
Step 3: Calculate the distance between one node and all other nodes using Eq. (2).
Step 4: Calculate the centroid of nodes using Eq. (3).
Step 5: Return all other nodes

3.1.2 Cluster Head Selection Using the Jellyfish Algorithm

The jellyfish breathing algorithm is used to figure out which CH will work best (CH). It is best to divide the network into a set number of groups, or clusters. Both sensor nodes use CH to tell each other where they are and how much energy they have left. This makes a cluster with the right number of cluster members (CMs) for each [54]. In the next cycle, CH may be made from sensor nodes with a lot of leftover energy. The cluster sometimes runs a jellyfish breathing algorithm to change the cluster size based on the number of nodes.

The number of N_c in circles made by certain CHs, and the number of redundant nodes are rearranged by parameters [N_{min}, N_{max}] that have already been set. If the number of CMs in a cluster is less than M_{min}, other normal nodes close to CH will be assigned to the cluster until Ni reaches Mmin.

Algorithm for Cluster Head Selection: Jellyfish algorithm

- Step 1: Initialize the network with N nodes and cluster Region CR_i
- Step 2: form Cluster Members (CM), limits M_{min}, M_{max}
- Step 3: Check the number of cluster circles with the maximum size of the cluster.

$$\text{if } N_c > M_{max} \text{then}$$
$$\text{while}(N_1 > M_{max})\text{do}$$

- Step 4: Update the circle region by using step 3

$$\text{End while}$$
$$\text{End if}$$
$$\text{else}$$

- Step 5: Check if $N_c < M_{min}$ do

$$\text{While}(N_C > M_{min}) \text{and } CR \leq CR_i$$
$$CR = (1 + a)CR$$
$$\text{End while}$$
$$\text{End if}$$

- Step 6: return circle region

3.1.3 Route Establishment

In order to identify paths across a network that uses energy efficiently while maintaining a fair distribution of that energy, this study introduces the Meta-Heuristic

Hybrid Moth Search Algorithm (HMSA) using the RPL protocol. It has been determined how well different meta-heuristic (MH) algorithms work in practice depending on the attributes [55]. The meta heuristic (MH) algorithm is used because of its ease of use, adaptability, and consistency. The vast majority of MH algorithms are quick, easy to set up, and not very complex. The large variety of optimization tools at this method's disposal means it can handle a wide variety of issues that traditional algorithms cannot. Ergodicity indicates that MH algorithms can find diverse multimodal search spaces while avoiding local optima. As can be seen in Fig. 2, it employs a synthesis technique to boost optimization precision and reliability while cutting down on measurement expenses.

Initialization

Your HMSA's ability to search for system-wide fixes is proportional to the location vectors you provide. Therefore, HMSA and all available channels of CH are necessary for the population to drown. Each Xth CH along a route P has its own coordinates in Cartesian space. CH(x), $P \in \Re$ (X=1, 2, 3,… n).

Each CH fitness function is calculated using residual energy by Eq. (4)

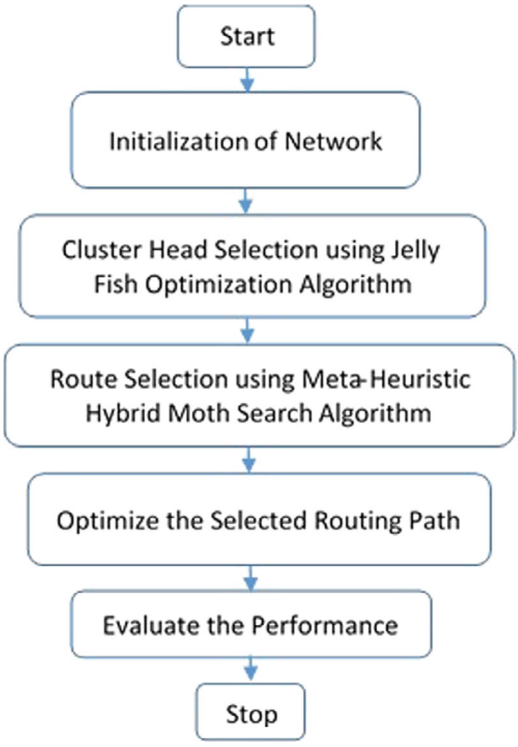


Fig. 2 Steps in proposed work

$$R - R\ residual\ \ energy\ of N_i = \frac{Available\ energy\ \ of\ \ N_i}{Total\ energy\ of\ \ N_i} \tag{4}$$

The ratio in a particular node N_i between the number of neighbors and the total number of nodes s in each cluster. The calculation of node degree N_i is given in

$$Degree(Node(N_i)) = \frac{Number\ of\ \ neighbours\, N_i}{Total\ number\ of\ \ nodes\ incluster} \tag{5}$$

The fitness value of Cluster Head is calculated by using the Eq. (6)

$$Fitness\ of\ \ Node(N_i) = W_1 * \ Residual\ Energy(N_i) + W_2 * Degree\ Node(N_i) \tag{6}$$

Path Selection

HMSA-routing RPL's procedure is based on the IETF's clustering RPL specification. It is the DODAG root that starts the process of delivering control messages to its CH node in the form of a DODAG information object for cluster (DIOC) messages. The DIOC message provides the child node with access to its parent's data. The best candidate for the parent node is likewise chosen with the help of an OF. After that, the child node will communicate with its parent node using DODAG advertisement object for cluster (DAOC) control messages. To wrap things up, the parent CH node of a DODAG sends DAOC-acknowledgement signals to each of its child nodes.

Objective Function

During data transfer, the OF aids in determining which parent node in DODAG is best. To find the optimal CH parent node in the hierarchy, Jellyfish-RPL investigates the routing measure R to R (Request-Response). The available energy in the parent CH node is represented by the ratio of R to R. Equation 7 provides the formula for determining R to R.

$$OF(R - R(x)) = RER(x) \tag{7}$$

The work flow of the total process is illustrated in Fig. 3.

Algorithm for Route Establishment

Step 1: Initiate network with n nodes
Step 2: Form Cluster using cluster formation algorithm
Step 3: Choose the CH using Jellyfish Algorithm
Step 4: Choose the parent CH node that receives the R-RDIOC message.
Step 5: Compute Cluster Rank for each head

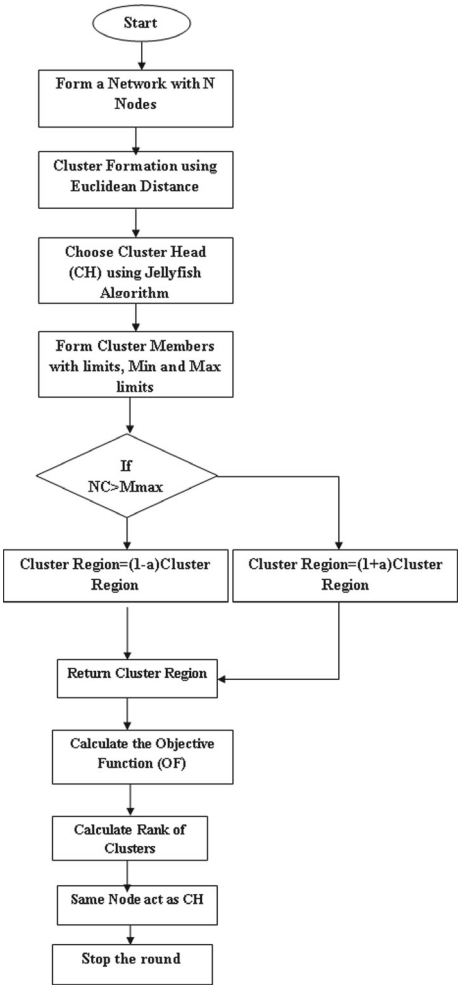


Fig. 3. Work flow of Jellyfish-RPL-HMSA protocol

$$Cluster\ Rank(i) = Parent_node(Cluster\ Rank(i) + Rank - increase$$
$$Rank\ Increase = step + Min\ hop(rank\ increase)$$

Step 6: Finalize the optimum CH Node
Step 7: Establish data communication

Table 1 Simulation parameter

Parameter	Value
Size of the network	1000 m × 1000 m
Number of nodes	250
Range of nodes	30–40 m
Energy at the initial stage	1.5 J
Transmission range	30 m
Size of data packets	512 bytes
Max Rounds	2500
Number of clusters	Different

4 Result and Discussion

4.1 Simulation Environment

The suggested method's performance will be analyzed by having it run on a cloud simulation environment and comparing the results to those of more traditional routing algorithms like HEED, FACER, and EACBM. Table 1 displays the settings made during the algorithm's initial deployment. Quantitative analysis of quality-of-service indicators such as power consumption, packet delivery rate, throughput, network life time, and packet delivery ratio.

4.2 QoS Parameter

4.2.1 Network Lifetime

The term "IoT life time" refers to how long a device can remain operational while carrying out its designated function(s).

$$Network\ Lifetime = \frac{\sum_{i=1}^{x} N_{i,j} * l_i}{q_a} \tag{8}$$

Regarding the coverage K, qa = K, a = 1, 2,… m, where N, q represent the coverage value and the number of nodes, respectively. The f in Nodes' lives symbolizes the passage of time. In Fig. 4, we can see how the lifespan performance of the current algorithmic network compares to the new technique proposed. It checks to see if the new algorithm can extend the life of IoT devices for longer than existing algorithms (5500 rotations).

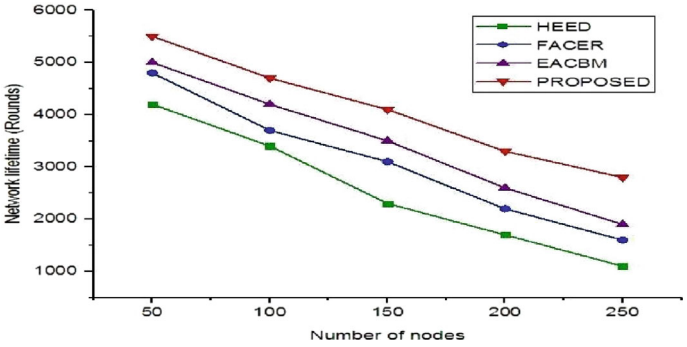


Fig. 4. Comparison of network lifetime

4.2.2 Energy Consumption

The network's SN's energy consumption, calculated using Eq. (9).

$$Energy\ Consumption = \left[\sum_{i=1} CH_E(i) + \sum_{j=1} CM_E(j) \right] \tag{9}$$

4.2.3 Throughput

The equation that describes the correlation between packet reception rate and transmission time delay is as follows.

$$Throughput = \frac{Total\ No.\ of\ Packets\ received}{Delay\ occured} \tag{10}$$

In cases where CH energy is referred to as CHE, force employed by various task-processing algorithms across various node units is depicted in Fig. 5. Comparatively, HEED, FACER, and EACBM based methods all need 3.2, 2.8, and 2.9 mJ of energy modules for 250 nodes, while the suggested technique only needs 2.4 mJ. Compared to the 250 node EACBM algorithm, the proposed technique resulted in a 21.8% decrease in energy consumption.

The required process and the computational capacity of a current system are depicted in Fig. 6. This chart illustrates the importance of free speech to the advancement of technology. The proposed approach outperforms the status quo in terms of throughput. Adding more SNs increases throughput.

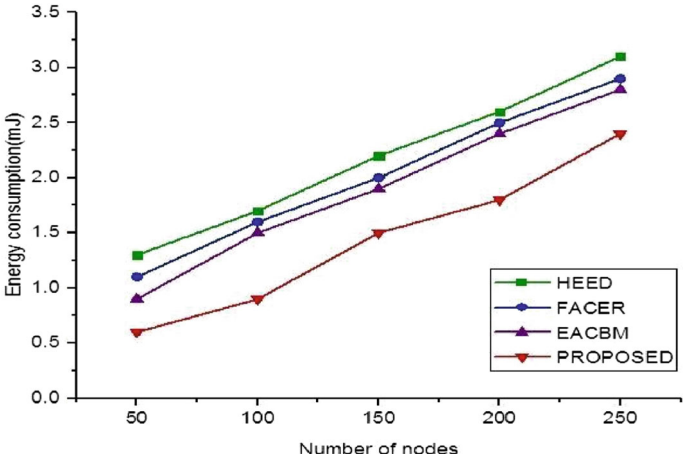


Fig. 5 Comparison of energy consumption

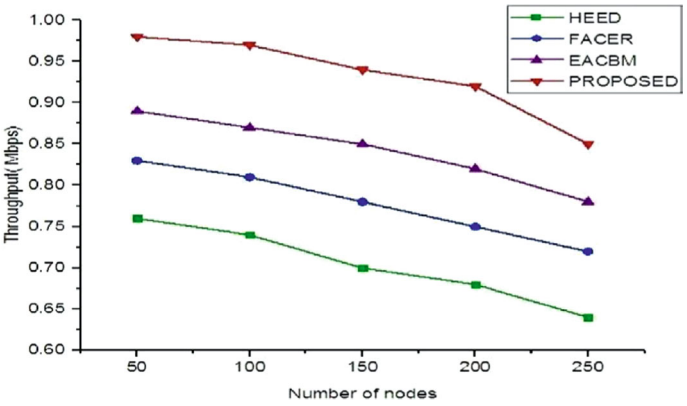


Fig. 6 Comparison of throughput

4.2.4 Packet Delivery Ratio

In order to calculate PDR, add up all of the packets the receiver has and all of the packets the sender has transmitted (11) (Fig. 7).

$$Packet\ Delivery\ Ratio(PDR) = \frac{Total\ No\ of\ packets\ received}{Total\ No\ of\ packets\ sent} * 100 \tag{11}$$

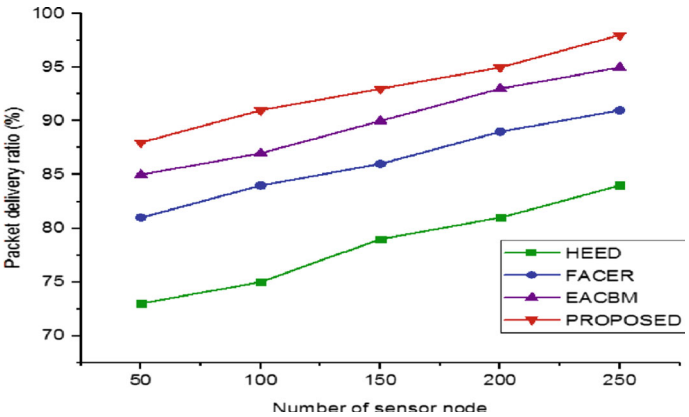


Fig. 7 PDR comparison

5 Conclusion and Future Work

Energy conservation is one of the major issues in the IoT during the data transmission. To avoid this constraint, different authors proposed various routing protocols. Among these, a cluster- based protocol shows more reliable network performance than other existing RPL protocols.

This article implements a new hybrid method of Jellyfish—RPL HMSA—for dealing with the problem. As a result of constant motion, sensor nodes have a short lifespan. The hybrid jellyfish algorithm selects non-powered block heads for a number of reasons, including cost, efficiency, and cost. The blockhead pelvic nodule's best course of action is determined with the help of HMSA. HMSA's results are measured against those of the optimization-based approach. The outcomes were displayed by the HMSA routing procedure. If you're looking for an upgrade from the old quality of service scale, this one is for you. The outcomes showed gains in throughput, energy efficiency, and packet delivery speed compared to more established methods.

To prevent illegal access from the outside world, we plan to continue developing our system, also factoring in a security measure that protects against black-hole, wormhole, and denial-of-service, black hole attacks. In addition, we want to develop JFO-HMSA with RPL in real-time and study its performance by randomly placing nodes around a network.

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Digital Transformation and its Impact on Sustainable Development: An Analytical Study



Amer Alsaraireh and Haya Riad Jaradat

Abstract The objective of the study is to investigate how digital transformation influences the attainment of sustainable development from the viewpoint of employees working in telecommunications firms. This transformation was assessed across three dimensions: digital strategy, digital human resources, and digital technology. In terms of sustainable development, the focus is on three key areas: economic, social, and environmental. The research involved a population of 680 employees holding administrative and supervisory roles within telecommunications companies. A descriptive-analytical methodology is employed, utilizing relevant statistical techniques through the SPSS software. Out of 350 distributed questionnaires, 268 responses are collected, forming the sample for the study. Findings indicated that digital transformation positively affects sustainable development across all its dimensions. The degree of implementation for both digital transformation and sustainable development within telecommunications companies is found to be high. The study suggests that telecommunications companies should persist in their digital transformation efforts and continue enhancing these initiatives in accordance with evolving digital demands and necessary tasks, while also maintaining their support for sustainable development.

Keywords Digital transformation · Sustainable development · Telecommunications companies

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1 Introduction

Digital transformation is regarded as a crucial element in attaining sustainable development and is seen as one of the most promising instruments [1, 28]. The integration of digital innovations into nearly all facets of our lives has become widespread, with digital transformation and data application emerging as a major trend that has transformed the global economy [2]. In addition, online markets, social media channels, and digital platforms have evolved into "essential infrastructure for communities [3].

Today, business organizations acknowledge that two essential pillars underpin management agendas and policies across the globe: digitization and sustainability [4]. Consequently, grasping the connection between digital transformation and efforts toward sustainable development has become vital [5].

As a result, technological progress has driven telecommunications firms to embrace digitization in order to stay competitive in today's economy, speed up their growth, and improve their standing among companies by actively supporting sustainable development initiatives [6].

1.1 Problem of the Study and Its Questions

The problem of the study can be summarized by the following main question: From the viewpoint of employees in telecommunications firms, does digital transformation—encompassing aspects like digital strategy, human resources, and technology—affect the attainment of sustainable development across its various dimensions (economic, social, and environmental)?

1.2 Study Model

- Independent Variable (Digital Transformation): [6, 7, 17].

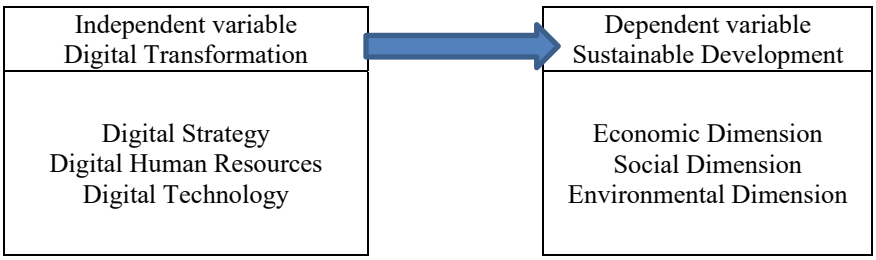


Fig. 1. Study model. *Source*: The study model was developed by the researchers based on previous studies as follows (Fig. 1):

- Dependent Variable (Sustainable Development): [8, 9].

1.3 Hypothesis of the Study

The hypothesis of the study is as follows:

- H0: "There is no statistically significant effect at the significance level ($\alpha \geq 0.05$) of digital transformation, in all its dimensions (digital strategy, digital human resources management, digital technology), on sustainable development in all its dimensions (economic, social, environmental) from the perspective of employees in telecommunications companies."

2 Theoretical Framework and Previous Studies

2.1 Digital Transformation

According to [10], digital transformation refers to an organization's capacity to adjust and utilize digital technologies to modify business models, enhance existing operations, and maintain sustainability. Some contend that it represents an evolutionary journey, serving as a fundamental idea for harnessing digital technologies through comprehensive coordination, prioritization, and execution to stay abreast of competitive shifts [11]. Organizations view digital transformation as a reaction to fluctuations in an unpredictable environment, employing digital technologies to transform their processes of value creation [12, 32].

Dimensions of Digital Transformation

Digital Strategy

The process of digital transformation is intricate and ongoing, potentially causing disruptions to company operations. As a result, creating a strategic plan for the long term stands out as a crucial step in effectively implementing digital transformation. Consequently, it is vital for top management to demonstrate their commitment by backing the implementation of digital transformation with a series of measures [2, 13, 14].

According to [23], it is strategy, not technology that ought to guide the digital transformation journey. The effectiveness of this transformation hinges on how organizations incorporate technology into their operations, resulting in alterations to fundamental organizational processes [15]. This integration brings forth challenges related to employee resistance to change, stemming from the implementation of new technologies. To effectively utilize digital technology and adjust to the new working

methods arising from digital transformation, a skilled workforce and technological competencies are essential [1, 16].

Digital Human Resources

Achieving digital transformation necessitates scientific knowledge and human skills, grounded in a comprehensive grasp of the need for this transition [17–19]. In telecommunications firms, human resources stand out as crucial elements of digital transformation [20]. They typically propel communities toward advancement and success across various sectors [21, 22]. The interplay between the human aspect and digital transformation is reciprocal; while digital transformation influences human resources, the latter also plays a role in enhancing productivity [7, 23]. Furthermore, the proficiency of human resources in digital capabilities serves as a significant catalyst for digital technology, supported by a competent digital workforce [24].

Digital Technology

The process of digital transformation involves the development of infrastructure through a network of devices, data, storage, and software that function within technical environments and data centers, facilitating the effective utilization of all resources [25, 26]. Additionally, it is essential to maintain a suitable level of service for both the organization's members and customers, which is managed by skilled teams tasked with supervising the technical systems and network infrastructure, regardless of whether it is cloud-based or local [15, 27, 28].

2.2 Sustainable Development

The term "sustainable development" describes a system capable of evolving endlessly for enhanced human welfare, improved resource efficiency, and alignment with an environment that supports human life [12, 29]. According to, [30] it is an ongoing, balanced, and holistic development process that incorporates social and environmental aspects in every project, striving to fulfill the needs of present generations while ensuring that future generations' needs are not jeopardized.

Dimensions of Sustainable Development

Economic Dimension

The concept known as "economic sustainability," as defined by [21], emphasizes the importance of maximizing financial revenue and profitability while ensuring that essential resources are utilized optimally over an extended and indefinite timeframe. In developing nations, sustainable development is an initiative focused on optimizing resource consumption and usage to alleviate poverty and enhance living conditions. Conversely, for developed nations, it entails the adoption of strategies designed to decrease the consumption of natural resources and alter consumption habits while simultaneously boosting productivity [4, 31].

Social Dimension

The social dimension pertains to a society's capability to establish processes and frameworks that cater to the needs of its current members while also enabling future generations to sustain those needs. A thriving society is essential for attaining social sustainability [20, 32]. Additionally, it demonstrates how effectively organizations meet their social goals, which play a crucial role in enhancing vital elements of society or fostering relationships with other communities [21, 33].

Environmental Dimension

This aspect includes the approaches that companies ought to implement regarding the environment, which involves the efficient utilization of natural resources while preventing their exhaustion and waste to preserve ecological equilibrium. Achieving this can be done through effective resource management, employing technologies to regulate waste generation, and transitioning to cleaner industries [26].

2.3 Previous Studies

The research conducted by [14], titled "The Role of Digital Transformation in Enhancing Sustainable Development Using Modern Managerial Accounting Methods: An Applied Study on Private Universities in Egypt," sought to explore how digital transformation technologies can enhance sustainable development via managerial accounting techniques. The findings indicated that the extent of digital transformation and its necessary applications within private universities were at a moderate level. Moreover, a statistically significant correlation was found between the various dimensions of digital transformation requirements and those of sustainable development, alongside a notable relationship between the dimensions of digital transformation and sustainable development, with the balanced scorecard serving as a mediating variable.

The study conducted by [3], titled "The Role of Digital Transformation in Achieving Sustainable Development within the Framework of Saudi Vision 2030," focused on identifying how digital transformation contributes to sustainable development as outlined in Saudi Vision 2030. It examined several aspects of digital transformation, including digital foundations, digital innovation, digital governments, digital business, and digital citizenship. Additionally, the research addressed various dimensions of sustainable development: environmental, economic, social, and technological. Findings from the study revealed that digital transformation significantly influences sustainable development across all these dimensions. The authors recommended an increased emphasis on digital transformation in different sectors.

Conversely, the study conducted by [26], titled "The Impact of Digital Transformation on Achieving Sustainable Development in the Context of the COVID-19 Pandemic (Applied to Some Arab Countries)," sought to emphasize the significance

of digital transformation in fostering sustainable development. It explored five dimensions of digital transformation: innovation, digital business, digital foundations, digital citizenship, and digital government, alongside four dimensions of sustainable development: environmental, economic, social, and technological. During the COVID-19 pandemic, the study evaluated the success of these nations using specific indicators. Findings revealed a statistically significant correlation between digital transformation and sustainable development within the examined countries, as well as a notable relationship between digital transformation and quality of life. However, the research also concluded that there was no significant link between digital transformation and the contribution to other aspects of sustainable development.

3 Study Methodology

The research employed a descriptive-analytical approach, distinguished by the application of descriptive statistics like frequencies and percentages to outline the attributes of the study sample. To gauge the significance of the respondents' responses concerning the variables and their dimensions, means and standard deviations were utilized. Two variables formed the foundation of the study: the independent variable, indicated by digital transformation, assessed through three dimensions (digital strategy, digital human resource management, and digital technology), and the dependent variable, represented by sustainable development, which was similarly evaluated through three dimensions (economic, social, and environmental).

3.1 Study Population and Sample

The present study focused on telecommunications firms that offer communication services. As reported [29], there are three primary companies: Zain, Orange, and Umniah, which collectively employ 2,246 individuals [29] This research specifically aimed at employees in managerial and supervisory roles, as they possess a deeper understanding and awareness of digital transformation and sustainable development. According to discussions held with HR managers, these companies have 680 employees occupying managerial and supervisory positions. A total of 350 questionnaires were distributed electronically through Google Forms to a purposive sample, resulting in 268 valid responses for analysis.

Table 1 illustrates that the Cronbach's Alpha coefficients varied from 0.748 to 0.852, all surpassing the minimum acceptable reliability threshold of 0.7. Consequently, the items within the questionnaire are regarded as having internal consistency.

Table 2 demonstrates that the variable of digital transformation holds significant importance, reflected in a mean value of 4.02, indicating a strong adoption rate of digital transformation among telecommunications companies. The dimension of

Table 1 Internal consistency of the study tool

Variable	Dimensions	Number of items	Cronbach's alpha
Digital transformation	Digital strategy	5	0.852
	Digital human resources	5	0.842
	Digital technology	5	0.748
Sustainable development	Economic dimension	5	0.817
	Social dimension	5	0.848
	Environmental dimension	5	0.839
Overall survey		30	0.944

Table 2 Description of digital transformation dimensions

Items	Dimension	Rank	Mean	Level of importance
1–5	Digital strategy	3	3.90	High
5–10	Digital human resources	2	3.92	High
11–15	Digital technology	1	4.24	High
1–15	Digital transformation		4.02	High

digital technology recorded the highest mean value at 4.24, while the digital human resources dimension followed with a mean of 3.92. Although it remains at a high level, the digital strategy dimension ranked lowest among the dimensions, with a mean value of 3.90.

3.2 Description of Sustainable Development Dimensions

Table 3 illustrates that the variable of sustainable development attained a significant level of importance, reflected by a mean value of 3.83, which signifies a strong organizational emphasis on sustainable development. Leading among the dimensions was the economic aspect, boasting the highest mean value of 4.06, categorizing it within the high level of importance. Next was the environmental dimension, which recorded a mean value of 3.94, also indicating a high level of importance. In contrast, the social dimension ranked lowest, with a mean value of 3.48, placing it within the medium level of importance.

Table 3 Description of sustainable development dimensions

Items	Dimension	Rank	Mean	Level of importance
16–20	Economic dimension	1	4.06	High
21–25	Social dimension	3	3.48	Medium
26–30	Environmental dimension	2	3.94	High
16–37	Sustainable development		3.83	High

4 Testing the Study Hypothesis

- **H0:** "There is no statistically significant effect at a significance level of ($\alpha \leq 0.05$) of digital transformation dimensions combined (digital strategy, digital human resource management, digital technology) on sustainable development dimensions combined (economic, social, environmental) from the perspective of employees of Jordanian telecommunications companies."

The hypothesis was tested using Multiple Linear Regression analysis, and Table 4 illustrates the results.

The *F*-value calculated stands at 624.458, accompanied by degrees of freedom (3/264). A comparison with the tabled *F*-value of 2.65 reveals that the calculated figure exceeds the tabled one, thereby affirming the significance of the regression model. The test's significance level is 0.000, which falls below the significance threshold of 0.05 established for the study. Furthermore, the significance levels for each aspect of digital transformation—digital strategy, digital human resources, and digital technology—are all under 0.05, with values of 0.000, 0.000, and 0.008, respectively. The corresponding *t*-values for these aspects are 7.367, 6.327, and 2.679, all surpassing the tabled *t*-value of 1.96. This confirms that these dimensions have a significant impact on the dependent variable. As a result, the null hypothesis is dismissed, and the alternative hypothesis is accepted, which asserts that there exists a statistically significant effect at a significance level of ($\alpha \leq 0.05$) from the combined dimensions of digital transformation (digital strategy, digital human resource management, digital technology) on the combined dimensions of sustainable development (economic, social, environmental) from the viewpoint of employees within Jordanian telecommunications companies. The *R*-value demonstrates a robust positive correlation between the dimensions of the independent variable (digital strategy, digital human resources, digital technology) and the dependent variable, as shown in Table 4, with a correlation value of 0.936. This significant correlation reinforces the conclusion of a statistically meaningful impact of the independent variable dimensions on the dependent variable. With an R^2 value of 0.876, it reveals that the combined independent variables (digital strategy, digital human resources, digital technology) account for 87.6% of the variance in sustainable development. The adjusted R^2 stands at 0.875, reflecting a slight difference of 0.001 from R^2, which suggests that the independent variables possess an acceptable predictive capability for the dependent variable.

Table 4 Main hypothesis test results

	Model summary			ANOVA			Independent Variable dimensions	Coefficients		
Dependent variable	R	R^2	Adjusted R^2	F	DF	Sig level		*B* value	*T* value	Sig level
Sustainable development	0.936	0.876	0.875	624.458	3	0.000	Digital strategy	0.341	7.367	0.000
					264		Digital human Resources	0.417	6.327	0.000
					267		Digital Technology	0.158	2.679	0.008

Table 5 Stepwise linear regression analysis results for the main hypothesis

Model	Digital transformation dimensions	*F*-Value	R	R^2	Calculated t	Significance level (Sig)
1	Digital human resources	1425.099	0.918	0.843	37.750	0.000
2	Digital human resources	911.843	0.934	0.873	11.066	0.000
	Digital strategy				7.971	0.000
3	Digital human resources	624.458	0.936	0.876	6.327	0.000
	Digital strategy				7.367	0.000
	Digital technology				2.679	0.008

The research utilized stepwise linear regression analysis to assess the individual significance of each dimension of the independent variable in relation to the mathematical model for the dimensions of the dependent variable. The results are presented in Table 5.

Table 5 Illustrates the order in which the dimensions of the independent variable entered the regression equation. The output from the analysis revealed three models created through the stepwise addition of the independent variable dimensions, determined by their explanatory power. According to the table, the dimension of digital human resources achieved the highest rank in explanatory power, explaining 84.3% of the variance in the dependent variable (sustainable development). Next, the digital strategy dimension contributed to an increase in explanatory power in the second model (which includes both digital human resources and digital strategy), accounting for 87.3% of the variance in sustainable development. In the third model, which encompasses three dimensions of digital transformation—digital human resources, digital strategy, and digital technology—the combined explanatory power of these dimensions rises to 87.6%. Consequently, we deduce that the digital technology dimension offers the least explanatory power regarding the sustainable development variable.

4.1 Results

- .From the viewpoint of employees in Jordanian telecommunications firms, the combined aspects of digital transformation—namely digital strategy, digital human resources management, and digital technology—exert a statistically significant influence on sustainable development, which encompasses economic,

social, and environmental dimensions. Furthermore, a robust positive correlation exists between the facets of digital transformation and sustainable development, suggesting that a heightened focus by telecommunications companies on executing and advancing digital transformation will have a favorable impact on the degree of sustainable development.

- Jordanian telecommunications companies exhibit a significant degree of digital transformation application, reflected in a mean score of (4.02) for the variable. Among the various dimensions, the digital technology aspect attained the highest mean at (4.24), signifying a robust level of implementation. Following closely, the digital human resources dimension secured a mean score of (3.92), while the digital strategy dimension recorded the lowest mean among all digital transformation dimensions, with a score of (3.90).
- Jordanian telecommunications companies exhibit a high level of adoption regarding sustainable development, reflected in a mean score of (3.83). This outcome arises from all aspects of sustainable development being rated highly, with the exception of the social dimension, which scored at a medium level, recording the lowest mean value of (3.48) among the dependent variable dimensions. Conversely, the economic dimension achieved the highest mean score of (4.06) among the sustainable development aspects, signifying a strong level of commitment.

4.2 Recommendations

- Telecommunications firms in Jordan ought to persist in their journey of digital transformation within their organizations, focusing on ongoing development to stay in sync with digital advancements and necessary tasks. Achieving this involves the continuous enhancement of technological devices and software to fulfill the demands of digital transformation and improve its quality, as well as further developing employees' skills in utilizing the tools, devices, and programs associated with digital transformation.
- Top executives within Jordanian telecommunications firms ought to persist in their active involvement in sustainable development across all facets: economic, social, and environmental. Achieving this can involve enhancing Jordan's international profile to draw foreign investments that elevate the economy, offering financial assistance to charities and civil society organizations that contribute to enhancing family social conditions, and backing social initiatives focused on education and scientific research.

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Study of the Impact of Interest Rates on Inflation, Savings, and Economic Growth: A Technical and Statistical Analysis



Yasar Alhiniti and Muhammad Nader Doshan Al-Madi

Abstract This research intends to investigate the connection between interest rates and various economic factors, including inflation, investment, savings, and consumption. It will analyze how these variables are influenced by interest rates, beginning with their effect on inflation; an increase in interest rates is demonstrated to lower inflation by diminishing aggregate demand, while also considering how anticipated inflation influences the correlation between nominal and real interest rates. Moreover, the research emphasizes the link between interest rates and investment, suggesting that elevated interest rates lead to a decrease in both investment volume and economic growth due to higher borrowing expenses, while simultaneously promoting savings and enhancing the resources available for investment. The study also examines the repercussions of interest rates on savings and income, pointing out that the influence of interest rates on savings volume is relatively minor in comparison to income levels. Lastly, it evaluates how interest rates impact consumption, revealing that rising interest rates result in a decline in private consumption by fostering savings and lowering the demand for money. Utilizing a descriptive analytical approach, the study encompasses a review of economic literature, data analysis through technical instruments like statistical software, and the implementation of sophisticated statistical models to derive insights and recommendations from the results obtained. It advocates for the formulation of monetary policies that strike a balance between encouraging investment and managing inflation, as well as the enhancement of savings strategies that promote sustainable economic growth. Additionally, the study emphasizes the importance of employing digital technologies for the collection and analysis of economic data, alongside the adoption of advanced technological solutions to assess the impacts of interest rate changes on various facets of the economy, ensuring overall economic stability.

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1 Introduction

Interest rates serve as a crucial economic indicator utilized by monetary policy to affect economic activity. To grasp the nature of macroeconomic forces, it is essential to recognize the connection between interest rates and other macroeconomic factors. Since interest rates emerge from the interplay of various economic elements—such as inflation, investment, savings, and consumption—examining their impacts is vital for formulating suitable economic policies.

Research in economics indicates that interest rates significantly impact the inflation rate. An increase in interest rates leads to a decrease in aggregate demand, which in turn alleviates inflationary pressures. Conversely, the expectations surrounding inflation can alter the dynamics between nominal and real interest rates. This underscores the necessity of grasping how fluctuations in interest rates affect inflation [1].

Additionally, investment is greatly influenced by interest rates. When interest rates rise, borrowing expenses increase, resulting in a decrease in both the level of investment and economic growth. Conversely, elevated interest rates promote savings, thereby improving the resource availability for future investments. Consequently, it is essential to examine the connection between interest rates and investment to grasp how monetary policies impact economic growth [2].

Savings and consumption are also influenced by interest rates. Although interest rates contribute to the determination of savings levels, their effect is relatively minor when compared to income levels. In terms of consumption, higher interest rates lead to a decrease in private spending by encouraging more deposits and savings while lowering the demand for money [3]. Therefore, it is crucial to examine the impact of interest rates on different facets of economic activity to develop balanced economic strategies.

1.1 Objectives of the Study

This study aims to achieve the following objectives:

1. Analyze the impact of interest rates on inflation by examining the relationship between interest rates and types of inflation and how changes in interest rates affect the level of inflation.
2. Analyze how interest rates affect the level of investment and economic growth.

3. Analyze how interest rates affect the propensity to save and its relationship with income levels.
4. Analyze the impact of changes in interest rates on the level of private consumption in Jordan.

1.2 Methodology

This research will address the relationship between interest rates and inflation, investment plus savings and consumption as basic macroeconomic variables through a descriptive analytical approach. The chapter will evaluate economic data extracted from official sources of information comprising central banks and economic reports to demonstrate the effect of interest rates on these variables. The researcher will also provide a literature review concerning various economic theories that have at one time explored how different interest rates are related to the economy at large [4]. By reviewing these theoretical frameworks, it intends to place its empirical findings within the context of established economic thought. In addition, it shall apply time-series data analysis in its approach when investigating the impact of interest rates over some time. This approach will enable an analysis of the varying effects of interest rate changes on inflation, investment, saving and consumption in a period of time, providing a dynamic view about interest rates and their relationships with activities within an economy. It seeks, through this inquiry, evidence of regularities that could be guidelines for economic policy and decision-making.

2 The Relationship Between Interest Rates and Economic Concepts

Interest rates are a core aspect of the economy and have a notable effect on various economic activities. Channels through which this influence spreads include different sectors such as investment, savings, economic growth, and inflation [5]. The methodology for investigating the relationship between interest rates and these economic principles is to first understand how this indicator plays an instrumental role in creating equilibrium between supply and demand within financial markets, as well as how it influences the economic decisions of individuals and businesses [6].

Interest rates, initially, portray the cost that borrowers incur on accessing funds or the income depositors earn from their savings [7]. These costs or income play a critical role in influencing financial and monetary policies, having an impact on various economic decisions. For example, growth of which a rise in interest rates can cause decreased consumption and decreased investment leading to less favorable economic activity while a decline can promote economic activity by fostering both investment and also consumption [8].

Interest rates are not standalone but are intrinsically linked to inflation, monetary policy, economic growth and the relationship between money and investment. Also, with an effect on the levels of economic activity and growth rates, interest rates are determined by interactions involving the principles of money supply dynamics and demand dynamics [9].

It is important to understand the relationship between interest rates and macroeconomic principles to appreciate how changes in interest rate policies impact the entire macro economy and how these policies can be used to achieve specific economic objectives such as ensuring price stability and promoting economic growth [10].

3 The Relationship Between Interest Rates and Inflation

Inflation is now seen as a very big issue that has an impact on the economy at local and global levels. The reason why economists do not agree on an exact definition of inflation is due to the different causes and effects of this problem, which makes it hard for them to deal with its implications.

Inflation is the continual increase in the general price level that results from an expansion of the money supply [11, 12]. In other words, it can also be described as a steady increase in prices underpinned by rising demand relative to supply (implying that an increase in the money supply reduces the purchasing power of money and raises price levels) [13].

There are several types of inflation, including:

1. **Visible Inflation**: Commonly referred to as open inflation, this form of inflation arises when prices increase freely due to the market dynamics of supply and demand, absent any governmental intervention or regulatory oversight. In such a situation, prices organically adjust to reach a balance between supply and demand, illustrating a direct correlation between inflation and market conditions [14].
2. **Suppressed Inflation**: This type of inflation occurs when price controls or ceilings are enforced by the government to stop prices from exceeding a specific threshold. The intention behind these price caps is to alleviate inflationary pressures and shield consumers from sudden price hikes. Nevertheless, although this approach can lessen the short-term effects of escalating prices, it risks creating shortages and other distortions in the market if the controls are established below the equilibrium price [15].
3. **Original or Genuine Inflation**: Authentic inflation takes place when there is a rise in aggregate demand that does not correspond with an equivalent increase in production levels. This disparity results in an overall increase in the price level as supply fails to keep pace with demand. Such inflation signifies fundamental economic imbalances, where pressures from heightened demand elevate prices because production capacity is inadequate to fulfill the growing demand [16, 17].

4. **Stagflation**: Stagflation is defined by the concurrent presence of elevated inflation and significant unemployment, frequently alongside stagnant economic growth. Advocates of new classical economics argue that these phases illustrate the concept of "policy ineffectiveness," in which an increase in money supply and budget deficits do not alleviate unemployment but rather lead to heightened inflation. This contradiction poses a challenge to conventional economic theories that presume monetary and fiscal measures can effectively manage both inflation and promote job creation at the same time [18, 19].

According to economist Irving Fisher, the actual dynamics of saving and investment dictate the real interest rate, which represents the exchange rate between present and future goods. Nevertheless, this rate does not always reflect what borrowers pay, as they typically borrow at the market rate, known as the nominal interest rate, which is the exchange rate between present and future money [20, 21].

When inflation is not present and all transactions occur in currency, the real and nominal interest rates align perfectly. Nonetheless, the expected inflation rate influences the nominal interest rate. As a result, economists hold varying opinions regarding the relationship between nominal and real interest rates [22].

A disparity will arise between investment productivity and savings return due to expected inflation at a specific nominal interest rate, which corresponds to the inflation rate. To ensure that saving and investment remain balanced amidst inflation, the nominal interest rate needs to increase by the inflation rate [23, 24]. Therefore, it is essential for researchers to examine how changes in interest rates influence the economy and inflation, helping individuals and businesses effectively handle their loan repayments [25].

4 The Relationship Between Interest Rates and Investment

A variety of studies have investigated the connection and effects of interest rates on investment. Findings indicate that real interest rates influence deposits, which subsequently have a positive effect on national savings in multiple developing nations. Additionally, in many developing countries, the level of investment generally reacts inversely to the real interest rate applied to loans.

A study found that real interest rates contribute to a rise in domestic savings, subsequently enhancing the pool of resources available for investment. This indicates a theoretical agreement that elevated interest rates promote bank savings, which then results in greater investments and increased credit volumes [26].

Economic growth is inversely correlated with interest rates [27]. In particular, when interest rates rise, growth tends to decline, whereas a decrease in interest rates fosters higher growth. Increasing borrowing costs through local banks raises interest rates, making it more expensive for individuals and investors to borrow. This can lead to a reduction in domestic consumer demand and liquidity in the markets [28]. Consequently, such a decrease lessens the appeal of new investments or the

expansion of current investments, adversely affecting economic growth rates and worsening problems related to poverty and unemployment [29].

Based on the information presented, the researcher clearly observes that investment is influenced by interest rates. A rise in interest rates has a detrimental effect on investment levels, deterring individuals from pursuing investment endeavors [4].

5 The Relationship Between Interest Rates, Income, and Savings

Economist John Maynard Keynes emphasized the intricate influence of interest rates on saving behavior, contesting the notion of a simple and uniform connection between savings levels and interest rates. He maintained that income levels are the primary factor determining savings, rather than the rates themselves. According to Keynes, individuals with low income are generally unlikely to save, irrespective of how elevated interest rates may be. This indicates that interest rates do not solely dictate savings habits; rather, the level of income is far more significant. Furthermore, Keynes suggested that when savings do not meet investment levels, interest rates may not serve as the most effective mechanism for reconciling the two. He believed that interest rates are not necessarily the link between savings and investment, as various other elements—such as economic conditions and income levels—also play a crucial role in these economic dynamics. Keynes' viewpoint highlights the complexity inherent in the interplay of interest rates, savings, and investment, implying that policymakers ought to take a wider array of factors into account when attempting to influence economic activities [5].

6 The Relationship Between Interest Rates and Consumption

The primary element of aggregate demand is consumption, which usually makes up about 60–70% of the overall total. In Jordan, however, consumption constituted 76% of the Gross Domestic Product (GDP) [7]. Consumption can be defined as the utilization of goods and services to fulfill needs and desires, including essentials like food, clothing, transportation, and education. Additionally, it is characterized as spending on consumer goods and services [12].

The connection between consumption and interest rates can be articulated as varying across different economic viewpoints. According to traditional economists, there exists an inverse relationship between these two factors. On the other hand, economist Keynes contended that the tendency to consume influences the share of income allocated to consumption rather than savings. Generally, when consumer

demand rises, it tends to boost demand for goods, resulting in increased import levels and a favorable effect on interest rates [17].

The common perspective suggests that private consumption is adversely affected by interest rates, a notion supported by real-world observations in Jordan. Typically, elevated interest rates result in a rise in deposits and savings, which diminishes the demand for money and, as a result, leads to a decline in private consumption [19, 21].

From the information presented, the researcher clearly observes that interest rates exert a considerable influence on the economy, with this influence being either beneficial or detrimental based on the level of the interest rate [24, 27]. Generally, lower interest rates are associated with positive economic outcomes, whereas higher rates tend to produce the contrary effect [28].

7 Conclusion

The interplay between interest rates and essential economic factors such as inflation, investment, savings, and consumption is vital for ensuring economic stability and promoting sustainable growth. This chapter went into great detail on how changes in interest rates affect these fundamental variables. It found that generally an increase in interest rates lead to lower inflation, lower levels of investment, higher savings and reduced private consumption. The rationale is that increasing interest rates push up the cost of borrowing for firms which then tends to dampen economic activity by curbing both investment and consumer spending while encouraging savings so as to realize greater returns from deposit accounts. On the other hand, decreasing interest rates tend to stimulate economic growth as it reduces the cost of borrowing, lowering also the incentive requirements for saving we would take back through inflation. This underscores finally that any monetary policy has to be very flexible and data-driven being designed based on specific objectives with accompanying indicators Economic indicators have made life much easier with regard to monitoring economic developments. The integration of advanced digital tools in the collection and analysis of economic data enables policymakers to attain more accurate and timely insights. Consequently, this enhances their capacity in designing and implementing effective monetary policies. Accuracy of economic data is improved by this technology integration, which further leads to better-informed choice of action; a stable, resilient economic environment is as a result created.

7.1 Results

The study concluded the following results:

1. **Rising interest rates and inflation**: Rising interest rates reduce inflation because expected inflation affects the relationship between nominal and real interest rates.

2. **Interest rates and investment**: Higher interest rates reduce investment and economic growth; higher rates encourage saving and increase the resources available for investment.
3. **Interest rates and saving**: Interest rates have a limited effect on the amount of saving, with income levels playing a more important role in determining saving.
4. **Interest rates and private consumption**: Rising interest rates reduce private consumption by encouraging saving and reducing the demand for money.

7.2 Recommendations

1. **Adjusting monetary policy**: Monetary authorities should adjust their policies to economic changes in order to maintain a balance between stimulating investment and controlling inflation. Flexible strategies should be adopted to cope with economic fluctuations and maintain price stability.
2. **Investment incentives**: Governments should increase investment incentives and lower the cost of borrowing through support programs and initiatives to mitigate the negative impact of high interest rates on investment.
3. **Encouraging Savings**: Policies should be improved to promote saving and raise awareness of its importance. This can be achieved through tax incentives and government-backed savings programs to encourage individuals to increase their savings.
4. **Digital Data Analytics**: Use digital data analytics tools and techniques to regularly monitor the effects of interest rate changes on the economy. Developing technology systems to track economic performance indicators can help make more effective decisions.
5. **Transparency and Information**: Improve transparency and provide accurate, up-to-date information on interest rate policies and their impact. Central banks and financial institutions should regularly publish data and analysis to ensure that all stakeholders are well-informed.
6. **Advanced Economic Analysis**: Invest in advanced economic analysis technologies, such as artificial intelligence and big data analytics, to improve economic forecasting and provide more accurate insights into the effects of interest rates.
7. **Periodic reviews**: Conduct periodic reviews of interest rate policies and adjust them based on economic developments and new data to ensure effective responses to evolving economic challenges.

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Impact of Multilingual AI on Decision-Making



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Abstract The swift advancement of multilingual artificial intelligence (AI) carries considerable consequences for decision-making across a range of fields, such as education, healthcare, finance, and governance. Systems of multilingual AI that can understand and generate some language naturally tend to reduce the language barriers to cross-linguistic communication, hence contributing to the reduction of such language barriers. This study focuses on the influence of multilingual AI on decision-making and capacity building for risk assessment in communication systems. The research shall be based on a qualitative methodology using descriptive and analytical techniques through a review of the available literature on multilingual AI and decision-making theories. Results suggest that multilingual AI systems could have effects on decision outcomes, user involvement, and cognitive functions in complex linguistic and cultural contexts. The study also raises issues on biases, decision accuracy, and non-representation of low-resource languages. These results contribute to the initiation of actions addressing societal implications of multilingual AI, which can return value toward the development of ethical AI and assuring equitable access to AI technologies.

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1 Introduction

Interest in the development of AI systems able to comprehend and produce natural language in humans has been growing in different parts of the world. This is mainly attributed to the developments in technology for natural language processing and the realization that as the world becomes a global village society, more AI systems can work across linguistic boundaries. What follows is the potential for a great reduction in these language barriers between country to country using many fields such as education, healthcare, finances, governance, among others—it will make it possible to provide low resource but also very diverse-language countries with such services [1]. There is, however, a need for effective multilingual AI systems; this is an immense challenge in the sense of resource languages and also how different the languages are [2]. The greater the use of AI in society moves, then with it comes increasing urgency for research and concerted attention in focusing also on the societal impacts of this important technology [3]. This chapter looks at how multilingual AI affects decision-making processes, empowerment activities, and risk assessments within systems of communication and deliberation [4].

Artificial intelligence pertains to the construction of algorithms that will support computers in simulating cognitive functions close to those of perception, reasoning, learning, and decision-making by human beings [2, 5]. For the attainment of such a simulation, digital systems are required to use different forms of representation to make sense of their connections within the real as well as the virtual environment [6]. Of all of these, natural languages are very important because they clearly provide verbal symbols of meaning [7]. Natural Language Processing is an area of research in which several machine learning algorithms help computers understand and generate human language with the help of propriety neural networks bearing semantic connections between words derived using statistics based on text data [2, 8]. These relationships are represented in vectors and deployed for a variety of NLP tasks, classification, translation, dialogue applications, and so forth [9].

Multilingual AI concerns understanding and generating natural language in multiple languages by AI systems, including those that are low-resource. It refers to translation systems able to cross different language borders [10]. It involves the technologies and methodologies required to develop and deploy multilingual AI systems: accompanying resources (e.g., multilingual datasets, tools for language processing) [2, 11]. There are European-based platforms and tools building upon language technologies empowered by AI and ML techniques, including language models and resources [12].

The speaking of several languages is termed multilingualism. It is not just an individual trait; it is also social, cultural, political, and economic in dimension. In the

context of AI, multilingualism signifies the capability of AI systems to function across various languages [13]. It has been instrumental in advancing AI technologies and applications throughout diverse linguistic, socio-cultural, and geographical contexts [3]. Multilingualism facilitates tasks such as translating texts from one language to another, comprehending and generating languages beyond the primary training language, automatically adjusting AI models through language transfer learning, retraining AI systems in additional languages, and developing technologies that enable multilingual functionalities, such as speech translation and cross-lingual knowledge base representations [4, 14]. The emergence of globalization, along with extensive networked media, communication, and content creation in various languages, has fostered a multilingual audience [15].

1.1 Importance of Multilingualism in AI

The importance of multilingualism for the development of future AI systems cannot be overstated. It enhances accessibility, broadens the talent pool, and fosters collaboration. However, the dominance of AI technologies by a small number of companies raises alarms about centralization and power disparities. Democratizing AI—ensuring that its benefits permeate the global population—calls for multilingualism. Integrated with this are the raised concerns about the amplifying potentials of disinformation, hate speech, and discrimination. There are enrooted problems of aligning AI systems with democratic principles and at the same time marginalizing a variety of languages. One of them is critical in terms of ensuring enough coverage for languages during machine translation. Because languages with few resources will consequently have a smaller amount of training data, this limits their potential applications and increases risks around them.

1.2 Methodology

The study employs a qualitative methodology to examine the impacts of Multilingual AI on Decision-Making. The descriptive framework was used for reviewing the literature on multilingual artificial intelligence and theories of decision-making in an integrative manner. The integration applies an interrelatedness of current literature on multilingual AI, theories of decision-making, and artificial intelligence from related fields like linguistics, psychology, and decision sciences with major studies associated with how multilingual AI systems affect the processes of decision making. As for the descriptive part, it reviews major works from the domains of AI, linguistics, psychology, and decision sciences that will combine knowledge on how multilingual AI systems influence human decision-making processes. Having finished the descriptive review, it will go on to perform the rest of the study through

an analytical perspective by seeking out patterns and relationships between multilingual AI systems and decision outcomes in varied linguistic and cultural settings. It was from this analytical perspective that the study derives insights about the influence of multiple languages in AI on decision accuracy and bias, as well as user interactions. The juxtaposition of the descriptive and analytic approaches will bring better details on what the implications of multilingual AI are on decision-making, therefore creating a well-informed debate and possible recommendations for future AI developments.

2 Language Variation and AI Performance

The development and implementation of AI are significantly influenced by the diversity of languages, especially due to the wide range of characteristics that languages possess, including phonetics, syntax, semantics, and pragmatics [5, 16]. Consequently, it is essential for developers of AI systems to take into account the differences found at both linguistic and cultural levels, particularly when integrating natural languages into AI applications. These differences can typically be grouped into two categories: (1) the various forms of language variations and (2) the effects of these variations on NLP and ML [6].

The development pace of AI applications differs across languages primarily due to variations in resources, cultural contexts, political empowerment within nations, government initiatives, and regulatory penalties. Additionally, languages are spoken and utilized in diverse ways globally [17]. Languages can be categorized based on the number of speakers into the following groups [6]:

1. Major languages.
2. Minor languages.
3. Vulnerable languages.
4. Endangered languages.
5. Critically endangered languages.
6. Extinct languages.

Ethnologue reports that over seven thousand languages are currently spoken as native tongues by individuals worldwide, and this number is steadily diminishing [6, 18]. Languages that qualify as major are those spoken by over ten million individuals globally. This can be examined through the use of extensive computational language models, resources, and pre-trained datasets that are readily accessible for these languages. For instance, Arabic has 452 million speakers, English boasts 1.452 billion speakers, Spanish is spoken by 489 million, and Hindi has 602 million speakers [7, 19]. AI systems such as Google Assistant, Siri, and ChatGPT are designed and trained using these prominent languages. Furthermore, various AI applications utilized for natural language processing (NLP) and other functions have focused exclusively on these languages worldwide.

2.1 Types of Language Variations

Two types of language variation were analyzed: (i) changes in a language code over time, geography, social structure, and other factors, resulting in variations in syntax, lexicon, and other structures at either a subjective or national level; (ii) variations in technical language, which encompass differences in syntax and lexicon according to levels of social discipline or specialization, such as in fields like economics or medicine [8]. Languages are not static; they evolve. Some languages have vanished, while others have come into existence. Languages are born, develop, decline, and ultimately die. As long as languages exist, they undergo change [8]. The field of historical linguistics focuses on the occurrence, causes, and effects of these language changes. Literature identifies over ten reasons for such changes, including social, economic, cultural, and factors related to politics, education, and religion. The evolution of languages can also be understood through the realities of the societies to which they belong.

Various types of distinctions exist among several industrial languages, such as English, French, German, and others. These differences can be categorized into three primary groups: phonetic differences, syntactic differences, and lexical differences. The term used to describe the linguistic phenomenon involving the alteration of a language code within a specific region or homeland over time, geography, and social structure is known as dialect or language variation of the first type [9]. A dialect represents a language form that diverges from the standard language in terms of syntax, lexicon, and other structural elements at either a subjective or national level [20, 21]. Both standard and non-standard languages fall under the umbrella of dialect [22]. Non-standard languages encompass local dialects, social dialects, historical dialects, and more [23]. Standard languages, referred to as high dialects, are those utilized by the majority of society or adopted by the ruling class [24].

There exist two tiers of differences in technical language, categorized as the second type of language variation: one at the discipline or specialization level, referred to as preliminary languages, and the other at the sub-discipline or sub-specialization level, known as further languages. Preliminary languages are those that are well-established both orthographically and conceptually within the domain of a discipline [25]. An example of this is Medical Languagization, which aims to utilize French for scientific research and higher education specifically within the science field [9]. It is unfounded to consider discipline languages as a native mother tongue shared by both disciplines and their respective technicians. The lexical surface of a discipline language comprises lexical elements derived from both a source and relevant passages to the language in question.

2.2 Impact on NLP and Machine Learning

The concept of language variation includes an intricate spectrum of differences and distinctions found within a language. Such variations can arise from geographic, social, and contextual factors, contributing to the continual evolution of any language utilized by a community of speakers. Linguists have extensively explored these varieties, classifying them into three primary categories: dialect-based linguistic variations, sociolect variations, and contextual speech variations [10, 26].

Differences in language stemming from dialects relate to phonological, syntactic, or morphological distinctions found in various geographical regions, whereas sociolects refer to variations shaped by social hierarchies [27]. The emergence of Modern Communication Devices (MCDs) has introduced a new form of contextual variation, as [28] noted these variations pose challenges to human information processing and simultaneously influence Natural Language Processing (NLP)-based Artificial Intelligence (AI) systems [29].

The differences present in these language variations can lead to the loss of both semantic meanings and syntactic structures, ultimately undermining the comprehension of text, audio, or speech recognition [28]. In some cases, successful understanding may necessitate the assistance of a specialist, or it might be entirely unattainable if the degree of language variation surpasses what is understandable. Speech generated by an unfamiliar dialect or variety can be incomprehensible, even to native speakers.

The understanding of these language variations by humans also influences NLP systems. Research conducted [30] on Information Retrieval has demonstrated the negative impact of dialect variations on AI systems that utilize NLP [30]. In the processing of regional dialect speech, these AI systems are unable to retrieve pertinent information in 60% of instances, while for regional non-standard Mandarin, this figure rises to 75% [31]. Comparable outcomes were observed in other NLP and machine learning tasks based on dialects, including Named Entity Recognition, Part-of-Speech tagging, sentiment analysis, and more.

In recent years, there has been a surge in the development and promotion of AI-based systems featuring multilingual capabilities, including deep-learning driven multilingual NLP frameworks, pre-trained LDs, and transferred-LD models equipped with cross-lingual tuning abilities that perform well across various languages. These multilingual NLP frameworks, using a limited number of examples, cultivate an understanding of a user's specific language variety and adapt their behavior accordingly. Nevertheless, it is crucial to note that these multilingual models do not inherently function as language variation models, making it equally essential to investigate how language variation impacts multilingual frameworks. Previous research has focused on the well-known disparities in language resources between high-resource and low-resource languages, as well as the enhancement of LDs and AI systems for the world's least-utilized languages [32].

3 Some Considerations in Multilingual AI

The technology of multilingual AI is continually developing, and like any other technology, it carries certain implications. This conversation highlights two key implications: bias and fairness, as well as privacy and data security. Although both address significant worries regarding the model's influence on society, they also embody particular issues that users, especially the more discerning ones, may have regarding it.

3.1 Bias and Fairness

Multilingual AI systems have the potential to intensify pre-existing biases or even introduce new forms of bias. Language models that are pre-trained, such as Skype, M-BERT, and XLM-R, which utilize diverse datasets, may reflect biases present across various languages, leading to fairness challenges that can extend from one language to another [33]. This issue of bias in multilingual AI is especially concerning in environments where English is not the primary language, as the majority of research has concentrated on English-centric systems. Common methods for addressing bias in multilingual systems include data-driven, inductive, and algorithmic approaches. Nevertheless, applying these methods to non-English systems presents added difficulties due to a scarcity of data and resources. Additionally, the manifestation of bias in multilingual AI can vary across different languages, a subject that has not received extensive investigation. While there have been research initiatives aimed at identifying and measuring biases in multilingual systems such as Google Translate, there remains a limited comprehension of how these biases compare to those found in monolingual systems [33].

Beyond the conventional concepts of algorithmic fairness, it is essential to investigate biases in multilingual systems related to language-specific fairness aspects, including the exacerbation of historical inequalities among languages. Additionally, multilingual AI has the potential to generate new biases, such as preferential treatment towards certain languages or dialects, alongside normative concerns about the emphasis on multilingualism in AI-driven social systems. Ensuring fairness, transparency, and accountability within multilingual AI systems necessitates a focus on international, cross-linguistic, and cross-cultural challenges [34]. As multilingual and cross-linguistic AI continues to become increasingly prevalent, numerous inquiries regarding the attainment of fairness in these systems warrant deeper investigation.

AI-driven systems have the potential to display bias in both detrimental and advantageous manners. In the case of harmful bias, specific groups find themselves at an unjust disadvantage ("bias against") [34]. Although the actions or decisions may seem neutral on the surface, they clearly target the affected group. Conversely, beneficial bias allows certain groups to receive an advantage, despite their arguably unwarranted preference ("bias in favor") [35]. Here too, the group is not the intended recipient

of harmful actions or decisions, even if those actions or decisions claim to "protect" or "uplift" them. It is crucial to analyze these forms of injustice together in both scenarios. For example, bias against a group can be intensified by the presence of bias in favor of that group, resulting in a harmful cycle of inequality. Nonetheless, these biases can be addressed separately, as unjust decisions can occur in one context without influencing the other [36].

Alongside the previously mentioned insights, a more advanced distinction can be drawn between bias originating from humans and that which arises from non-human sources. In this context, bias of human origin refers to both the direct infusion of societal prejudices into algorithmic systems and the accurate reflection of societal structures and inequalities within these systems. Conversely, bias of non-human origin includes algorithmic artifacts that cannot be clearly traced back to human actions, beliefs, or intentions. In principle, these types of bias may coexist, interact, or even contradict one another. For instance, a technology with default settings that benefits a specific group can unintentionally bestow or withdraw favor, as this benefit is not directly linked to a human action or intention [37]. The presence or absence of intentionality is not viewed as a definitive criterion for categorizing distinct forms of bias, and therefore, it does not hold significance in the analysis of bias in AI.

3.2 Privacy and Data Security

The rise in concerns regarding privacy and data security is unmistakable. The increasing prevalence of multilingual AI systems amplifies the potential for personal or sensitive information within text data sets to be leaked or misappropriated. For example, while ChatGPT can generate content in various languages, it presents the challenge of restricting access to segments of the training data that inform language models [37]. Likewise, the widespread and varied use of search engines in rural regions necessitates the establishment of policies focused on language accessibility and the influence of technology in media capture. To safeguard user data privacy, national strategies aimed at developing language models must be implemented. It is essential to close the gap between current legal frameworks that address privacy and AI. Promoting the advancement of responsible multilingual NLP technologies through collaboration among multiple stakeholders is vital and should be prioritized on the policy agenda [38].

The rapid evolution of the legal landscape concerning privacy and AI presents challenges for users attempting to understand current frameworks and their implications for data privacy and safety. Given the significant potential for NLP models to positively impact marginalized language communities, it is essential to safeguard users against the possible repercussions of misuse [39]. There is now such an urgent call for the vendors and corporate bodies that deal in NLP tools as services to set out best practices under the present legal frameworks of privacy and AI [37]. These highly resourced stakeholders within the Global North and Global South could take an active role in steering responsible and fair development related to multilingual NLP

technologies—such that they steward benefits for all languages and dialects spoken everywhere on our globe [37]. Those developing NLP systems offering language models as services need to place user data privacy at the forefront, keeping communities safe from peering eyes that could do scrutiny, monitoring or even exposure [40].

4 Applications of AI

Multilingual AI technology, being put forward right now, is going to provide a new field of applications across various industries. These multilingual AI systems play a vital role in the decision-making process within a number of regions and sectors; for example, from healthcare to financial services. We will provide an overview in the next two case studies that develop the flexibility and effectiveness of multilingual AI systems to increase the capacity to make decisions.

4.1 Multilingual Chatbots

Machine learning and natural language processing have come a long way in the development of multilingual chatbots with robust functionalities in artificial intelligence for conversation [38]. These solutions enable businesses to deploy AI-driven multilingual customer support and engagement across geographies, helping drive ROI by reducing response time with availability all the time. Many other players such as Aivo, Solvemate, Messagely abound in the market that offers multilingual artificial intelligence chatbot solutions. However, many challenges surround this implementation [38].

An increasing number of companies now have access to a diverse array of multilingual AI chatbot solutions, which are driven by various machine learning models and utilize different datasets for training and evaluation [41]. These chatbots can deliver a near-human interaction experience for clients in multiple languages across numerous platforms and channels. As a result, businesses no longer need to engage in costly and time-consuming translation projects to connect with new linguistic audiences; multilingual bots enable companies to expand globally almost instantly [39]. Presently, many organizations depend on these AI bots to address inquiries and resolve issues without requiring human involvement. Nevertheless, despite their evident success and widespread acceptance, chatbots possess a troubling aspect. Spam bots that send automated messages are undermining user experience on various social media platforms, and AI chatbots operating in a language that the user does not fully comprehend can result in significant misunderstandings. Inappropriately used AI bots, such as OpenAI's ChatGPT, have the potential to mislead users through misinformation and various scams [39].

A significant challenge exists within the technological sphere. By default, AI and machine learning-based chatbots do not inherently "speak" any natural language; instead, they rely primarily on mathematical models [40]. Today's multilingual AI text chatbots utilize multilingual sentence embeddings or multilingual language models to map text from various languages into a unified space. Following this, the decision-making logic—whether rule-based, retrieval-based, or generative-based—determines the subsequent processing steps from multiple message options based on that specific mathematical representation. As a result, varying technologies yield different outputs. Therefore, similar intents can produce distinct responses depending on the foundational multilingual ML models employed. Additionally, the linguistic datasets available for training and testing multilingual AI chatbots are often restricted to particular use cases or low-resourced languages [40]. To assess the effectiveness of competing multilingual AI chatbot solutions in real-world multilingual environments, there is a need for rich datasets encompassing multilingual intents and utterances across various business domains. When designing and integrating multilingual chatbots into their customer engagement channels, developers must take these challenges into consideration.

4.2 Translation and Localization Tools

Due to the worldwide growth of businesses and services, along with the rise of contemporary technologies, translation and localization tools have become crucial. These tools enable the translation of various languages using computer systems, allowing for communication beyond language barriers while preserving the original message. Machine Translation (MT) refers to a computer system that automatically converts a source language into a target language. On the other hand, Localization modifies the translated content to account for cultural factors relevant to a specific region while keeping the meaning intact [40]. Translation tools leverage both MT and L10n to streamline the process of translating multilingual texts.

Fueled by globalization, the market for translation and localization tools is projected to reach USD 56.18 billion by 2025, boasting a compound annual growth rate (CAGR) of 7.13% [41]. Numerous technologies and services are encompassed within translation and localization tools, such as Translation Memory (TM) and terminology databases that have been developed by researchers over many years. Currently, these technologies are incorporated into popular Computer-Aided Translation (CAT) programs, which serve as essential tools for translation and localization. TM functions as a repository of translated sentences maintained in a database, offering suggestions for upcoming translation segments [41]. Meanwhile, terminology databases keep track of domain-specific terms and their translations, ensuring consistency.

Worldwide, companies, agencies, and freelancers utilize translation and localization tools to enhance the quality of their translated texts while saving time. These tools yield superior outcomes compared to traditional methods through effective

segmentation and internal processing. Among the commonly employed translation and localization tools are SDL Trados Studio, MemoQ, WordFast, and OmegaT. SDL Trados Studio integrates features such as Translation Memory, machine translation, terminology management, and post-editing capabilities [41]. MemoQ serves as a robust CAT program, offering TM, MQ Linguistic Assets, and machine translation options, along with an online translation platform tailored for freelancers. OmegaT stands out as a free, open-source CAT program that provides Translation Memory, Multiple-file Processing, and support for various file formats [41].

5 Conclusion

The way people think and communicate is being profoundly transformed by the emergence of multilingual AI. It is essential to grasp its potential and obstacles for effective regulation and application. By facilitating communication across various languages, multilingual AI influences cognition and encourages conformity. Furthermore, it has the power to impact significant policies and alter power structures. The languages selected for interaction with AI play a crucial role in shaping cognition and behavior. The development and extensive adoption of multilingual AI are contributing to the formation of a global digital consciousness. To address its effects, it is important to examine its implications. Additionally, the rise of multilingual AI systems exacerbates disparities among linguistic and cultural communities.

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Integrating Technology into Education: How Technology Makes a Difference in Classrooms



Safeyah Tawil and Aladdin Tarawneh

Abstract This research seeks to examine how digitization influences the quality of education within Saudi schools, particularly highlighting the "Madrasati" platform as a key example in this area. An analytical approach was utilized, which involved reviewing pertinent literature and analyzing data collected from surveys and interviews conducted with both teachers and students. Findings revealed that educational technology and digitization have greatly enhanced educational quality by offering interactive and adaptable learning materials, fostering greater interaction between students and educators, and narrowing educational disparities. Furthermore, these platforms have improved students' access to learning materials and encouraged self-directed learning. In light of these results, the study suggests enhancing training programs for teachers regarding technology use, consistently updating educational platforms, broadening access to technology in underserved areas, and incorporating educational games as tools for motivation. Moreover, the study underlines the regularity of appraisals concerning technological initiatives' effectiveness and a growth in digital involvement of students and teachers so as to adjust to technological advancement and make the most of its benefits.

Keywords Digitization · Educational quality · Madrasati platform · Educational technology · Student interaction · Teacher training

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1 Introduction

During this age of rapid technological revolution and advanced information technology, digitization has crept into every area of our lives, including education [1]. The digitization of how we deliver education represents a major shift in the ways teaching and learning content is provided, which results from quality improvements and increased effects [2, 3].

It should be understood that digital education is not only using technological tools but also converting educational data and information into easily accessible and manageable digital form which helps to create an interactive inclusive learning environment [1, 4]. The most important development in the evolution of the educational system is digitization because it enables the provision of modern multimedia educational content that assists in closing educational inequalities and meeting all learners' needs, especially those who fail with traditional education [2, 5, 6]. As a result, the incorporation of technology into education has become an imperative necessity, especially given the shifts brought about by the COVID-19 pandemic, which compelled educational institutions to adopt online learning as a substitute for face-to-face instruction [7, 8].

It is important to highlight that one of the leading uses of digitization in education is online learning, which employs digital technology to present educational materials in multiple formats, such as texts, images, and videos, thereby rendering the learning experience more interactive and adaptable [9, 10]. Successful models for remote education, like the "Madrasati" platform in Saudi Arabia, exemplify how electronic educational platforms can improve educational effectiveness and broaden access to information and resources [3, 11]. Therefore, this paper seeks to investigate the impact of digitalization on education through a discussion of the benefits of e-learning with an exclusive focus on the importance of educational technology in improving education quality.

1.1 Study Objectives

- Assess the impact of digital technologies and modern techniques on the educational process.
- Analyze the benefits and importance of integrating technology into education.
- Analyze the impact of the "Madrasati" platform on education in Saudi Arabia.
- Identify the challenges faced in integrating technology into education.
- Provide recommendations for improving the use of technology in education.

1.2 Study Methodology

A descriptive methodology was utilized in the study to investigate how digitization affects education, focusing on the advantages of online learning and clarifying the significance of educational technologies in enhancing educational quality. This approach was selected due to its relevance to the subject matter and its capacity to deliver a thorough and accurate examination of the implications of digitization within the educational sector.

2 Digitization and Education

Amidst the current surge in knowledge and technology, initiating educational reform and development has become essential [12, 13]. This involves utilizing technological advancements throughout all areas of education to improve both the quality and effectiveness of learning, a process referred to as digitization [14, 15]. Incorporating technology into the educational framework allows for the delivery of more engaging and thorough educational materials, addressing the needs of every student, including those who struggle to access conventional education due to social, health, political, or geographical factors [4, 16].

According to [5], digitization is the transformation of information, data, and processes into a format suitable for review, storage, and processing through computers and diverse technological tools [17]. He highlights its significance within the education sector, marking a crucial change in the delivery and management of educational content. The [6] note that numerous educational institutions have embraced digitization for various reasons, such as offering extensive digital information, safeguarding information sources from harm, and enhancing the ease of data retrieval and searching [18, 19].

Within the realm of education, digitization provides sophisticated informational services, including selective broadcasting of information, digital reference assistance, automatic translation, and swift exchanges of information between individuals and educational entities [20, 21]. Moreover, it allows for the ongoing refreshment of educational content, empowering institutions to deliver current and pertinent materials to students at any time and place, thereby expanding opportunities for self-directed and lifelong learning [22, 23].

The significance of digitization in education specifically lies in its contribution to addressing many educational issues, such as [7]:

- Reducing individual differences between students.
- Solving many problems that hinder the learning and teaching process.
- Enabling the digitization of educational and scientific resources at any time and geographical location, which helps to meet the significant increase in demand for these resources, thus increasing the quality of education and accessibility for everyone.

2.1 Integrating Technology into Education

In light of the swift technological progress affecting various sectors, especially education, there has been a considerable transformation in how technology is incorporated into learning [24, 25]. This incorporation became particularly evident following the COVID-19 pandemic, which compelled students around the globe to move from conventional classroom settings to online learning [26, 27].

Digital technology enhances e-learning by utilizing educational resources in multiple formats, such as images, videos, and audio, displayed on digital devices like computers or mobile devices to aid the learning process [28]. This form of education integrates two domains: technology and learning, where learning refers to the cognitive acquisition of knowledge, and technology serves as the instrument that enables this acquisition [8, 29].

A common misconception is that e-learning represents a novel approach to education; however, numerous countries have been implementing e-learning since the Internet's inception, aiming primarily to elevate educational quality and improve students' knowledge outcomes. Due to its various benefits, e-learning is regarded as highly effective [9]:

- Enabling students to learn online anytime and anywhere.
- Increasing the number of students using educational materials.
- Facilitating the exchange of skills and experiences between educational institutions in different countries.
- Providing multiple tools and methods to easily update data and information on educational content.
- Enabling quick assessment of students, viewing their results, and providing feedback.
- Reducing the cost of materials and the psychological pressure of children attending school.
- Facilitating access to information and viewing online educational experiences, thereby saving time, effort, and costs.

Numerous studies have explored the significance of incorporating educational technologies and electronic platforms into existing educational frameworks [30]. For example, [10] pointed out that the effective use of technological systems is crucial for attaining institutional excellence in Saudi Arabia's educational institutions. In a similar vein, [11] noted that prioritizing technological solutions within schools is a primary strategy for achieving excellence, as educational institutions increasingly implement sophisticated digital tools to improve their operations. Schools are vying to secure the latest digital innovations and are establishing all necessary conditions to facilitate e-learning, which has recently emerged as a response to current educational challenges.

The [12] emphasized that delivering high-quality e-learning is vital for every educational institution or academic program and serves as a fundamental requirement for the success of the educational process. To guarantee the effectiveness of any

educational system or institution, it is imperative to comply with international quality standards for e-learning. Consequently, educational institutions need to enhance the quality of their programs and plans to keep pace with educational and administrative advancements, thereby achieving excellence in all their services.

According to [13], the significance of e-learning, which utilizes virtual classrooms and educational platforms, has surged in importance within the educational landscape following the COVID-19 pandemic, marking it as a key element for achieving excellence and advancement in schools. Furthermore [14] emphasized that institutional excellence is attained through the strategies implemented by institutions to guarantee quality and distinction. To navigate future developments and transformations, specific policies at both the administrative and academic levels are essential, ensuring that schools can adapt to market changes and demands. These policies should encompass standards for the integration of technology in education, including the utilization and activation of electronic learning platforms [31]. This study advocates for the extensive implementation of e-learning technologies in educational institutions, with the goal of closing the existing digital divide and effectively incorporating information and communication technologies into these institutions.

The [15] advocated for the modernization and revision of traditional practices and regulations within educational institutions to better align with contemporary teaching approaches that utilize virtual classrooms and educational platforms, thereby enhancing student engagement in the learning process and greatly advancing their skills [16]. Pointed out that exceptional educational institutions must adapt to the information technology surge by choosing suitable technologies for their operations and assessing all resources and technologies that correspond with their aims and objectives. Additionally, [17] highlighted that one of the primary barriers to institutional excellence is the limited and superficial application of modern educational technologies, like educational platforms, stressing that simply acquiring these technologies without making substantial efforts to implement them effectively in student education poses a significant challenge.

The findings clearly indicate that focusing on educational technologies, tools, and platforms is vital for fostering scientific progress within society. These platforms significantly contribute to enriching the educational experience and substantially boosting the competitiveness of schools.

2.2 Computer-Based Learning Strategies

Strategies for computer-based learning seek to incorporate contemporary computing technologies, encompassing both hardware and software, into the educational landscape to meet academic objectives and foster an engaging learning atmosphere that captivates and inspires students [32]. These approaches assist learners in navigating obstacles within their educational journey and boost their academic efficiency [2]. By integrating technology into the learning experience, these strategies promote

curiosity, facilitate active involvement, and improve interaction with educational materials.

This strategy incorporates essential techniques such as self-directed learning via interactive educational software, online educational platforms, and e-learning tools. It can be applied at different educational levels, ranging from early childhood through adolescence, effectively enhancing a variety of academic skills, including reading, writing, listening, communication, spelling, mathematics, as well as social and motor skills. The implementation process starts with assessing students' acceptance and utilization of technology, followed by an evaluation of the devices available in the school. After training students to effectively use these devices, technology can then be integrated into the educational process once proficiency is achieved [18].

2.3 Educational Games

A category of electronic games known as educational games can be divided into three primary types: entertainment games, puzzle games, and educational games. Each type has distinct objectives: entertainment games focus on providing amusement and engaging content for leisure; puzzle games enhance cognitive abilities by promoting problem-solving; and educational games seamlessly combine the enjoyment of play with the acquisition of knowledge [19].

The rise of educational games can be attributed to advancements in technology, particularly in the wake of the COVID-19 pandemic, which hastened the incorporation of technology into the educational sphere. According to [20], educational games are defined as interactive games utilized on electronic devices featuring smart applications that encompass engaging visuals, graphics, and multimedia, all aimed at fulfilling particular educational objectives [21]. Characterize these games as educational software designed to align with educational settings, integrating specific rules that combine instruction with entertainment, inspire students, and alleviate the dullness of conventional teaching methods.

According to, educational games are defined as electronic games that require human interaction with a user interface, providing visual feedback on devices such as smartphones, tablets, and computers. These games aim to impart particular concepts or enhance student skills, frequently integrating competitive aspects regulated by rules to meet educational goals.

There are several key benefits of incorporating educational games into the learning process, including [22]:

- **Enhanced Engagement:** Educational games increase student participation in the classroom by providing digital learning resources that make learning more exciting and engaging.
- **Improved Retention:** Games improve students' ability to retain knowledge by engaging multiple senses—sight, hearing, and touch—thus improving memory and recall.

- **Personalized Learning:** Educational games encourage self-paced learning, allowing students to learn at their own pace and review difficult concepts at any time.

3 Education and Technology in Saudi Arabia

3.1 "Madrasati" Platform

The urgent necessity for advanced educational systems has emerged from the swift progress in technology, particularly in response to the fundamental changes brought about by the COVID-19 pandemic [33]. This crisis has reshaped how educators perceive the nature, objectives, methods, and strategies within educational institutions. Rather than being confined by time and location, students now have the opportunity to enroll in educational programs and pursue their studies at their own convenience. Therefore, it is essential for educational institutions in Saudi Arabia to adapt to rapid technological advancements in order to sustain their competitive edge on the global platform. Achieving this objective entails the integration of technological and communication tools, implementing organizational modifications in educational strategies, and enhancing the technical skills of all educational personnel to improve educational outcomes and strive for excellence, whether at the level of individual schools or within the broader Saudi education system [23].

In response to this advancement, the "Madrasati" platform was introduced during the COVID-19 pandemic. This platform, which is the first of its kind managed by the Ministry of Education in Saudi Arabia, aims to equip students with knowledge and skills through remote learning, thus supporting their educational progress. Currently, the "Madrasati" platform continues to be utilized in schools, where both students and teachers leverage the available information and activities to enhance the learning experience. Furthermore, it provides an opportunity for students to access recorded lessons if they miss school, enabling them to keep up with their studies. The platform also facilitates the completion of assignments and the administration of exams [24].

It is significant to observe that the tangible outcomes of schools' commitment to educating students through educational platforms have become apparent. This dedication positively impacts students, teachers, and their families alike. The quality of these platforms now showcases a school's level of excellence and its capacity to integrate technologies into education, thereby acting as a mirror of institutional quality. Additionally, these platforms highlight the crucial role technology plays in the educational process and represent the true functions of methods and strategies in curriculum development and student learning [25].

"Madrasati" platform is an online virtual classroom, easily accessible through laptops or smartphones and hence ensuring the educational process to go on between the teacher and student during this COVID-19 period. This platform allows teachers

to upload different educational resources with it covering materials, activities, assignments, and exams. On the other hand, students can take part in virtual lessons as they get to know their teachers and later submit their homeworks [26].

It should be noted that after its implementation, the "Madrasati" platform has been assessed through various research studies. One of these, carried out by Al-Kinani and [16], revealed a very high level of teacher satisfaction with how well the platform can be used in education. This study confirmed that the technical design of the platform is excellent and that it has a positive impact on the quality of teaching by providing multimedia resources through which ideas are well-demonstrated to students [34–36].

Moreover, the study by [27] captured insights from teachers and students in relation to their experiences on the "Madrasati" platform, revealing that a good number from both parties were satisfied with the way they conducted their interactions, although students sometimes showed some lack of motivation by actively participating in classroom sessions. The findings from about the "Madrasati" platform indicate its coverage for 47 educational departments, 275 educational supervision offices, 25,000 public schools, 729 private schools, and more than five million students throughout the Kingdom of Saudi Arabia. In just the first semester since the onset of the COVID-19 pandemic, over 90 million virtual lessons were conducted and later followed up by another 63 million virtual lessons in the next semester [32].

It should be noted that the Madrasati platform is an inseparable part of the educational process and is regularly updated. As researched by, the Madrasati platform will become a key support resource for hybrid educational models at this time within the Saudi education system by offering such innovative tools as virtual reality programs to help students develop their critical thinking, digital, and life skills. The platform will be more active in terms of students' learning than passive in merely storing resources [37, 38].

3.2 Application Software for Computers and Its Uses in Education

It is important to highlight the abundance of application software utilized in the realm of education. These software programs serve as a vital component of contemporary educational technology, significantly contributing to the enhancement and facilitation of both teaching and learning. Defined as programs created to execute specific tasks or offer particular services to computer users, application software in education is employed in diverse manners to elevate educational quality and boost the efficiency of the educational process [11]:

Various software applications play a significant role in improving education by offering advanced tools and resources that enable teachers and students to engage with knowledge in creative and varied manners. Some of the key application software programs include [9]:

1. **Educational Management Software:** These programs play a crucial role in structuring and overseeing the educational process, including Learning Management Systems (LMS) that enable educators to share course materials, monitor student progress, and evaluate performance. A significant illustration of this is Moodle, a widely utilized open-source Learning Management System in schools and universities that facilitates course management, tracks student advancement, and organizes assessments and exams.
2. **Educational Authoring Software:** These applications help in designing interactive teaching and learning resources: virtual lessons, self-assessment tests, and educational talks. They provide resources to create educational content catering to the specific needs of the learners. One example is Adobe Captivate, a widely known tool used in developing interactive educational content such as presentations and virtual lectures that empower educators to create personalized learning experiences for students.
3. **Simulation Software:** They enable virtual learning environments by replicating real-world scenarios or experiences, such as virtual laboratory experiments that do not require students to have physical resources for them to engage in experiential learning and practice. A noteworthy example of this is PhET Interactive Simulations, where a lot of free interactive simulations across various disciplines such as physics, chemistry, biology and mathematics are available. With these simulations, students can perform virtual experiments based on what would happen in real-life situations.
4. **Academic Research Software:** Students and researchers can easily access extensive databases and academic references through these programs, which also offer tools for data analysis and scientific inquiry. A prime example is EndNote, a reference management software. It helps researchers in collecting, organizing, and creating bibliographies. Very useful for writing research papers.
5. **E-Learning Software:** This is done through initiatives that facilitate Internet-based online education allowing students to access their lectures and educational resources from any place and at any time which widens the educational opportunities and increases the access to information. A notable example is Google Classroom, which is an e-learning platform where teachers can share lessons and assignments while also administrating virtual classrooms, thus providing students with the ability to engage with course content plus take part in online discussions.
6. **Graphic Design and Multimedia Software:** These help in developing visual and audio content which when used for teaching serve to enhance understanding of concepts by students through the delivery of information in an interesting and innovative way. An example is Adobe Photoshop, a graphic design tool used for creating and editing images and graphics. It can also be used in developing visual teaching materials that present ideas more interestingly.
7. **Word Processing and Spreadsheet Software:** These applications are useful for taking data and putting it in order, analyzing that data, and presenting the results in a structured and easily understandable manner and can also be of help when it comes to writing research papers and formulating academic reports. Two

common examples are Microsoft Word, one of the most frequently used word processing programs that offers professional text editing and formatting tools—great for writing research papers and academic document creation. Microsoft Excel is further a spreadsheet application used for data organization and analysis; this helps users create charts as well as carry out advanced computations.

4 Conclusion

This paper underlines the very important role of digitalization in education as a necessary tool for the development of the educational process and also as an adaption of modern technological developments. The effect of digitalization in enhancing the quality of education is immense since it offers interactive and complete educational materials that help students to easily access information and resources with great efficiency and efforts. The impact of digitalization is particularly noticeable in the improvement of e-learning as it allows students to learn at any time and place while increasing their involvement with educational content through various means. With such innovative technologies, namely digital games and e-learning platforms like Madrasati, education systems take great steps toward meeting students' needs and achieving successful learning outcomes. All in all, the integration of technology into education acts as a fundamental step leading toward the improvement within education to ultimately achieve its sustainability within the system.

4.1 Results

1. It has been proven that digitalization and educational technology can enhance the quality of education by facilitating the availability of interactive and full-fledged educational content.
2. Platforms like "Madrasati" have furthered student engagement with educational content, delivering it at any time and any place where learning takes place.
3. Technology has made education to be easily accessed by those students who come from very remote areas and those who find it hard to catch up with the traditional way of education.
4. E-learning tools have provided quick assessment methods and accurate feedback, helping to improve student performance.

4.2 Recommendations

- Educational institutions should improve training programs for teachers and administrators on the effective use of educational technology.

- Continuous updates and development of educational platforms such as "Madrasati" are needed to meet the needs of students and adapt to technological changes.
- Efforts should be made to bridge the digital divide by providing technology and educational resources to students in remote areas and those who do not have sufficient resources.
- Regular evaluations of the effectiveness of technology programs and educational platforms should be conducted, and recommendations for improvement should be made based on user feedback.
- Keeping up with the latest developments in educational technology and integrating them into the educational process is essential to maximize their benefits.

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Law and E-Commerce: Understanding the Legal Classifications of Electronic Stores



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Abstract The objective of the study is to examine the legal characteristics of electronic stores, particularly in differentiating them from other potentially comparable legal entities. Utilizing a descriptive-analytical approach, the research involved gathering and evaluating data through an examination of legal and jurisprudential literature, alongside comparisons of various viewpoints within this domain. Findings indicated that the legal classification of electronic stores significantly differs based on jurisprudential and legislative trends; some perspectives regard the electronic store as a distinct legal entity, while others characterize it as a collective legal structure or an intangible asset. In light of these findings, the study advocates for the establishment of clear and specific legislation to better delineate electronic stores from similar entities, as well as the creation of a flexible legal framework that adapts to contemporary technological and commercial advancements, ensuring the safeguarding of all parties' rights involved.

Keywords Legal nature · Electronic stores · E-commerce · Legal frameworks · Consumer rights · Legal distinction · Legal classification

1 Introduction

In today's digital era, electronic stores play a vital role in the global economy, offering innovative and effective methods for trade and communication among consumers and businesses. As dependence on these electronic platforms grows, it becomes crucial to have a clear understanding of the legal characteristics of these stores. There has been

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a range of jurisprudential perspectives regarding the legal classification of electronic stores, highlighting the need for comprehensive research to precisely define their legal nature.

The legal classification of electronic stores differs based on the jurisprudential perspective taken. Some interpret it as a legal entity made up of a collection of interconnected legal elements and processes, whereas others regard it as a tangible entity that has distinct characteristics, rights, and obligations. Conversely, certain viewpoints consider the electronic store to be intangible movable property, characterized by non-material attributes linked to legal and economic worth. Furthermore, there is a divergence of opinions when it comes to differentiating between electronic stores that may share similarities in their legal nature.

Given this variation, the objective of this study is to investigate the legal characteristics of electronic stores, emphasizing their differentiation from potentially comparable entities. The researchers intend to examine a range of legal studies and jurisprudential perspectives to comprehend the classification of these stores and to elucidate the essential criteria required for the clarity of the legal frameworks that regulate these developing commercial activities.

1.1 Study Objectives

This study aims to achieve the following objectives:

1. To examine various theories explaining the legal nature of an e-commerce store, including the collective legal theory, the collective factual theory, and the intellectual property theory.
2. To analyze how an e-commerce store is classified as an independent legal entity, part of the entrepreneur's financial assets, or intellectual property.
3. To explain the differences between an e-commerce store and a website in terms of purpose, function, and target audience.
4. To explain the differences between e-commerce stores and e-commerce websites in the trading system, targeting, and related risks.
5. To examine how the legal classification of an e-commerce store affects the rights and obligations of the entrepreneur and customers.

1.2 Study Methodology

The research adopts a descriptive-analytic approach to studiously examine the legal dimensions of e-stores. This includes an analysis and evaluation of various jurisprudential opinions on the proper legal categorization of such stores and distinguishing between them. A significant amount of relevant national and international legislation was reviewed, as well as its application concerning e-store contexts. It also critically examined information drawn from legal data and previous studies with the aim of

coming up with an explanation that appreciates differences among the classifications, intended to generate findings in a manner closely related to providing insights with regard to the legal character of electronic stores.

2 The Legal Nature of the Electronic Store

Scholars have differed in their views regarding the legal status of the electronic store. Some argue that it operates as a separate legal entity with independent financial obligations from those of the trader; others consider it to be a factual or actual entity. There is also an opinion that looks at it as an intangible movable asset. It has a hybrid nature, comprising aspects of both physical and intangible components [1].

The commercial store is an independent financial liability, or allocation, theory: German jurisprudence has adopted this view as it perceives the commercial store as a separate juridical entity or an independent financial liability distinct from those of the trader. According to this perspective, the store has rights and duties that are not those of the trader in his personal capacity. This is in line with the German legislator's concept because multiple financial liabilities are permitted; that is to say, one can have several liabilities, each as a separate entity and existing independently [2].

A consequence of utilizing the legal collective theory is that the creditors of the commercial store gain precedence in satisfying their claims, free from rivalry with other creditors of the trader. The debts of the store are linked to it and constitute its particular obligations. Consequently, the creditors of the store possess the sole authority to assert their claims against it without facing competition from the trader's other creditors.

According to the researchers, this theory dissects the financial responsibilities of the trader without adequately clarifying the legal status of the electronic store. Additionally, it contradicts the comprehensive nature of the trader's financial liability, which includes all their assets, as outlined in Article 365 of the Jordanian Civil Code. This article asserts, "subject to the provisions of the law, all the debtor's assets are liable for the fulfillment of their debts, and all creditors are equal in this security" [3, 4].

The factual or actual collective theory constitutes the second theory. Due to the inconsistency between the legal collective theory and the legal basis of numerous laws, including those in Jordan, which support the principle of unified financial liability, some academics have interpreted the commercial store as a factual aggregation of assets instead of a legal entity. This perspective is supported by the presence of a genuine and tangible relationship among the different components of the commercial store [5–8].

From this perspective, the commercial store is viewed not as a standalone legal entity with distinct rights and debts, but as a network of interacting components. When these components come together for the sake of commercial investment, they form a specific asset within the financial liabilities of the trader, yet do not create a separate financial obligation for the store independent of its owner's liabilities [9].

In essence, the financial responsibilities linked to the store are seen as part of the broader financial obligations of the store owner. Consequently, the store is perceived as a tangible or factual entity, made up of a group of assets that are collectively aimed at fulfilling a shared objective [10–14].

The theory of intellectual property, introduced by the French Scholar Professor Georges Ripert, originated in France. This final theory corresponds with the jurisprudential perspective that the ownership of a commercial store exists when there is a connection with customers and vanishes upon its loss. The additional components that make up the store primarily function to draw in and keep customers, anticipating an increase in their numbers. The core of this theory is its differentiation between the store as a standalone entity and its tangible and intangible components, recognizing the trader's entitlement to their store as intellectual property [15–19].

Advocates of this theory maintain that the distinction between a commercial store and its components implies that alterations or the absence of its elements do not influence the store's existence. For instance, changes like replacing industrial equipment, moving furniture, or altering the address do not impact the existence of the store. The store persists regardless of missing furniture, its reduction, or a change in location, among other factors. Additionally, it is acceptable to dispose of the elements of the commercial store independently of the store itself. For instance, if a trader transfers a patent while keeping their store, this does not affect the store's ongoing existence. Likewise, selling the furniture within the store does not equate to the store's disappearance, as it continues to exist with the same characteristics and attributes as the store that once housed the furniture [20].

Modern jurisprudence has adopted this theory due to its coherent rationale regarding the legal characteristics of the electronic store. It views the electronic store as an intangible movable asset that comprises both physical and intangible components, with customers being the most vital aspect. As a result, a trader can designate a portion of their assets for business operations without detaching it from their financial obligations, all while retaining intellectual property rights over what is termed commercial property. This framework enables them to monopolize and leverage their store while also safeguarding it through lawsuits related to unfair competition [21–25].

Customers represent the fundamental component of the electronic store, with the remaining elements serving merely as tools to support the presence of this key aspect. According to the researchers, the third theory stands out as the most precise regarding its clarity, the explanation of its components, and the legal characteristics of the electronic store. Additionally, this theory corresponds with the definition of the electronic store as a blend of tangible and intangible elements, enabling the trader to utilize and legally safeguard their store through lawsuits related to unfair competition.

2.1 Distinguishing the E-commerce Store

While many individuals think that websites and e-commerce stores are alike, they actually possess several distinct differences. Typically, websites function as venues for individuals to showcase their ideas, share their work, and offer a range of information at no cost, fostering connections among users. On the other hand, e-commerce stores focus on selling products or services to consumers, highlighting one of the many differences between the two. Consequently, this section will explore the contrasts between regular websites and e-commerce stores, as well as e-commerce websites [26–30].

Distinguishing Between E-commerce Stores and Websites

A common misconception is that websites and e-commerce stores are the same, yet important distinctions exist between the two. While an e-commerce store focuses solely on showcasing and selling products and services to customers, a website encompasses a wider range of functions. Websites can serve various purposes, including entertainment, education, consultation, or news dissemination. Additionally, they can facilitate commercial endeavors, like e-commerce websites, which can lead to confusion about the differentiation between e-commerce stores and e-commerce websites, as both engage in commercial activities [31].

An e-commerce store can be defined as a tool utilized by merchants for conducting business, comprising various tangible and intangible components that work together to draw in the primary element of the store—i.e., customers—and allow them to access the available products and services [32]. Conversely, a website is characterized as "a collection of interconnected pages, texts, images, and digital videos organized in a cohesive and interactive framework on a server computer, with each site possessing a specific and unique address that differentiates it from other sites on the Internet. Access to the website is unrestricted by time or location" [33].

According to the Jordanian Electronic Crimes Law, a website is defined as "a space for providing information on the information network through a specific address" [34]. In a similar vein, the UAE Federal Decree-Law No. 34 of 2021 concerning Combating Rumors and Electronic Crimes characterizes a website as "a virtual place or space on the information network that relies on smart programs enabling its users to provide, exchange, or publish any content whether textual, audio, visual, or data. It includes websites, social networks, platforms, personal pages, blogs, and electronic services" [35].

The researchers assert that while it is not the legislator's responsibility to define, the UAE legislator has broadened the concept of a website to encompass personal accounts and social media platforms, in contrast to the Jordanian legislator, who restricted it to a segment of the information network. A website is characterized by the researchers as an online space designed to offer users information and to ease their access to necessary services and information [36].

In terms of functionality, websites act as a platform for individuals to showcase their ideas or creations via personal blogs, share valuable information at no

cost through encyclopedic resources, support education through e-learning, enable connections between people, promote cultural exchange, and deliver entertainment through social media platforms. Additionally, they serve as an important marketing asset that boosts profits and streamlines various tasks by saving time [37].

Conversely, the main objective of an e-commerce store is evident from the outset which is to market a product or service to online customers. This distinction is fundamental regarding subject matter, as an e-commerce store has a defined purpose, focusing on attracting a larger customer base by highlighting products or services. In contrast, a website can manifest in numerous ways and is not confined to just one aspect; it may be entertaining, educational, commercial, or serve other functions [38].

For instance, "Azzam Watches" is a retailer focused on selling timepieces in the Middle East, while "Kith" specializes in casual and athletic apparel. In contrast, platforms such as Facebook and Twitter facilitate connections among individuals.

E-commerce stores focus solely on selling particular products to consumers, with their main role being the promotion and sale of these items. On the other hand, websites serve to connect individuals, foster cultural exchanges, and offer entertainment, as well as education and the distribution of news, among other functions [39].

When it comes to the target audience, the most vital component for an e-commerce store is its customers or buyers. Their presence is fundamental to the store's survival and success, while other factors are established to draw in this audience.

E-commerce stores focus on customers who are specifically looking to buy the products they offer, while websites have a broader and more varied target audience. Catering to a wide range of interests, websites include educational platforms for learners, news sites for those keen on current events and sharing information, and entertainment sites for individuals seeking leisure through social media and other avenues. Consequently, websites aim at diverse groups according to their interests [40].

As an illustration, "Qabani Furniture" focuses on the production, export, and import of furniture, catering to those looking to purchase furniture. On the other hand, "Google" appeals to a wide demographic, encompassing school-aged children, university students, and individuals of all ages seeking information for research. Likewise, platforms like Facebook and Instagram serve as entertainment and social networking sites aimed at all age ranges, while e-commerce websites specifically target groups interested in buying goods and products [41].

When it comes to payment, standard websites typically do not require multiple payment options, as their inclusion may be superfluous. In contrast, for e-commerce stores, having diverse payment methods is essential, as offering a purchasing option is vital for the establishment of the store. Consequently, a range of electronic payment services is accessible in e-commerce platforms [42].

As an example, "AIIBIRDS" is a retailer focused on selling footwear, where transactions can solely be completed through payment. In contrast, accessing "YouTube" is without charge, and watching videos does not necessitate any payment [39].

Distinguishing Between E-commerce Stores and E-commerce Websites.

Many individuals believe that e-commerce websites and e-commerce stores are identical. While both serve online commercial functions, they possess crucial distinctions. E-commerce stores focus on drawing buyers to purchase specific goods and services. In contrast, e-commerce websites cater to both buyers and sellers, who are integral to their framework. Visitors to an e-commerce store typically encounter a select range of products from a single brand, whereas e-commerce websites showcase a wide array of products and brands from various merchants. This diversity enhances user experience on the site, as multiple traders contribute to a larger customer base and increased visibility for the platform [43].

An illustration of this is "Open Market," an e-commerce platform that allows customers to assume the roles of both buyer and seller. Users can simultaneously list an item for sale, like a car or a house, while also purchasing a watch or a parcel of land that is available on the market. Consequently, this platform aims to appeal to both buyers and sellers, showcasing a diverse array of products, including cars, watches, cosmetics, and various services, in contrast to e-commerce sites that focus on a single product category. For example, "AIIBIRDS" specializes in selling shoes, drawing in customers who are particularly interested in buying footwear [39].

When it comes to risk, an owner of an e-commerce store faces expenses related to buying, storing, and promoting products. Should products go unsold or there be a lack of buyers, the owner is responsible for the costs associated with the products, storage, and marketing, which can result in significant losses. Conversely, an e-commerce website owner is not required to buy products or pay for storage; these obligations are handled by the traders. The website owner focuses solely on marketing and advertising, and if those efforts do not succeed, their losses are confined to those activities.

Additionally, should the website owner be unsuccessful in drawing in both sellers and buyers, they will merely face losses in marketing. In terms of workload, sales generated on the site must surpass those made in a physical store to attain equivalent profit, since the site owner divides profits with traders and earns a commission from every sale. Conversely, store owners keep all the profits but contend with a limited product selection compared to websites, resulting in increased risk and possibly reduced profit margins [44].

As an illustration, "Open Market" does not keep any goods or services in stock. Rather, the owner of the site offers space for traders via leasing agreements and concentrates on advertising and marketing. On the other hand, "Qabani Furniture" engages in the processes of purchasing, manufacturing, storing, showcasing, and promoting furniture. Should marketing strategies fall short, the store owner is responsible for the expenses related to storage and any possible damage to the furniture, which could lead to selling it at a lower price and facing further losses [45].

When it comes to the volume of inventory, both e-commerce stores and websites require substantial amounts. However, the effect of this inventory is more pronounced on the physical store than on the website. In cases where products go unsold, the store owner is compelled to cut prices to facilitate sales, whereas e-commerce websites have the option to eliminate unsold items from their platforms without suffering

any financial losses. Unlike store owners, website operators do not engage in price reductions, and the amount of inventory held is determined by the storage capacity of the traders.

For example, "Shein" and "Modanisa" present a broad selection of items such as clothing, shoes, bags, household goods, and more, allowing customers to enjoy numerous options from a single platform. In contrast, "Azzam Watches" is dedicated exclusively to the sale of watches, meaning that customers can only buy watches there. If certain items on "Modanisa" and "Shein" fail to gain popularity, they can be eliminated from the site without incurring any financial repercussions, while store owners must sell unsold inventory—often at a loss—to clear it out [46].

3 Guarantee Rules in Protecting the Contracting Parties in Electronic Sales via Online Stores

The rise in transactions conducted through online retailers has made it essential to implement regulations that safeguard the rights of both buyers and sellers. To ensure consumer protection, legislations have created legal assurances that govern the responsibilities of suppliers in providing a secure environment for finalizing electronic sales agreements through online platforms [47].

This section will examine the rules governing guarantees in electronic contracts formed through online retail. It will begin with traditional guarantees in subsection 3.1, covering the obligation to provide assurance against defects and warranty of ownership, alongside the seller's duty to guarantee against hidden defects, concluding with the power to modify or void unfair terms. Following this, the discussion will shift to modern guarantees in subsection 3.2, which encompass the seller's responsibility to inform the consumer, the assurance of the safety of the sold product, the obligation for the seller to deliver an item that aligns with the advertisement, and ultimately, the safeguarding of the consumer's personal data [48].

3.1 Protection of the Consumer Contracting via Online Stores Through Traditional Guarantees

Contracts for sales carry risks related to consumer exposure, including fraud, seller misrepresentation, or failure to meet contractual duties. Consequently, it is crucial to address consumer protection in these transactions through various conventional guarantees outlined in legislative texts [49, 50].

Obligation to Guarantee Against Hidden Defects.

The obligation to ensure protection against hidden defects that may arise in the product falls on the seller. Article 513/1 of the Jordanian Civil Code outlines this responsibility, stating, "If a defect appears in the sold item that was previously known,

the buyer has the option to either return it or accept it at the specified price, and cannot keep it while claiming a reduction in the price due to the defect" [40].

The purchaser is entitled to obtain the purchased item without any defects. The Civil Code's general principles apply to electronic sales agreements conducted via online retailers. This is further specified by the UAE legislator in Article 544 of the Federal Law on Civil Transactions.

1. Should a previously known defect manifest in the purchased item, the buyer may choose to either return it or accept it at the agreed-upon price, but they cannot retain the item while seeking a price reduction due to the defect.
2. A defect is deemed old if it was present in the item before the sale or arose after the sale while still in the seller's possession prior to delivery.
3. If a defect arises with the buyer, it is classified as old if it stems from a pre-existing cause that was present in the item while it was with the seller.
4. An old defect must be hidden; a hidden defect refers to one that is not apparent on the surface of the item, cannot be detected by an average person, is only revealed by an expert, or emerges solely through testing.

The defect in question must be both substantial and hidden, with the seller having not relinquished responsibility for it. For instance, if an individual purchases a phone from an online retailer and subsequently discovers a defect, like memory loss, which is undetectable through standard inspection, then the buyer has the right to return the product under warranty [42].

The severity of the defect is not a requirement; it only needs to be deemed unacceptable by the buyer. When a consumer engages with an online retailer to buy a product influenced by the store's advertisements, and later discovers a defect that reduces its value and renders it undesirable, the buyer is entitled to pursue a remedy from the seller for that defect [33].

For a buyer to assert a claim against the seller, good faith in contracting necessitates that the buyer is not aware of any defects in the item being sold. Article 514/2 of the Jordanian Civil Code articulates this principle, "The seller is not responsible for the old defect if the buyer was aware of it when purchasing the item" [34].

The same principle is upheld by UAE law. A buyer who is aware of a defect prior to purchase or delivery forfeits their right to claim any hidden defect later, as well as their warranty rights. In the realm of online sales, the consumer is at a disadvantage, lacking the expertise and knowledge about the product that the seller possesses, who is in a more advantageous position and capable of navigating legal processes. To establish a claim, the consumer must demonstrate the presence of a hidden defect, prove their lack of awareness regarding it, and show that the seller was aware of the defect and deliberately hidden it. This scenario places an excessive burden on the consumer, violating their fundamental right to receive a product free from defects [35].

Legislators in both the UAE and Jordan have established that when it comes to hidden defects, a buyer's choices are restricted to either canceling the contract or accepting the item at the agreed-upon price. According to Article 513/1 of the Jordanian Civil Code, "If a defect appears in the sold item that was previously

known, the buyer has the option to either return it or accept it at the specified price, and cannot keep it while claiming a reduction in the price due to the defect" [46].

This indicates that when the outlined conditions are fulfilled and the defect is established, the consumer is entitled to either cancel the contract or obtain the agreed-upon price. Nevertheless, this may not always benefit the consumer, as they might only possess the right to cancel the contract or receive the price, without the option to exchange the item or request a price reduction. As stated in Article 513/1, "… and cannot keep it while claiming a reduction in the price due to the defect" [47].

As outlined in the explanatory memorandum of the Jordanian Civil Code, internet sales are categorized as a type of distance selling, placing the responsibility for both receipt and return costs on the buyer. Consequently, it might be more advantageous for the buyer to retain the item and request a price reduction instead of canceling the sale and returning the product [38].

Obligation to Guarantee Against Claims of Ownership and Encumbrances.

The second responsibility involves providing assurance against claims of ownership and any encumbrances. Article 506 specifies: "Liability for the price cannot be waived by the seller in the event of a claim of ownership regarding the item, and such a stipulation renders the sale invalid. Indeed, the buyer's awareness that the seller does not own the item does not preclude them from asserting the price based on such a claim" [4].

A sale becomes invalid if an agreement is established that omits the seller's guarantee. Even if the buyer is aware that the seller does not own the item, this knowledge does not stop them from pursuing the price based on such a claim. For instance, consider a situation where an individual purchases a weight loss product from an online retailer, and the seller disclaims any responsibility regarding ownership claims; in this case, the contract is deemed invalid. If the buyer understands that the seller lacks ownership of the product at the time of the transaction and that it will be available upon claim, and when the claim is made the item is absent, the buyer retains the right to seek the price from the seller [1].

It is essential to dismiss any contracts that undermine or relinquish protections ensuring the buyer's entitlement to enjoy the sale free from disruption by the seller or outside parties. Should a claim of ownership arise that challenges the buyer's right to the item, it is the seller's responsibility to become involved in the legal proceedings. In cases where a third party asserts a claim to the item, the buyer is entitled to seek reimbursement for the purchase price and associated costs from the seller [31].

Authority to Amend and Cancel Unfair Terms.

Adhesion contracts frequently contain unjust terms and can manifest in various ways, including standard agreements that the adhering party accepts without negotiation and that are exclusively drafted by the other party [27]. A legal or actual monopoly over an essential item is not required as a condition for the dynamic between a dominant and a subordinate economic entity, nor must it stem from any evident economic advantage [28, 32].

This matter is addressed by the Jordanian legislator in Article 104 of the Civil Code, which specifies: "In adhesion contracts, acceptance is confined to simply agreeing to the predetermined terms established by the offeror, leaving no opportunity for negotiation." Additionally, Article 204 of the same legislation states, "Should a contract be formed through adhesion and contain unjust terms, the court has the authority to modify these terms or relieve the adhering party from them based on what justice requires. Any contrary agreement is considered void" [43].

The texts suggest that the legislator intended to offer robust protection to the adhering party against the exploitation by the stronger party, who frequently incorporates ambiguous language into the contract, compelling the adhering party to accept such terms. When a term is unclear or ambiguous, the interests of the adhering party are prioritized due to established rules of interpretation. The authority of the judge extends beyond the interpretation of vague terms; it encompasses all terms, including those that are explicit, provided the judge can infer a lack of mutual intent between the parties involved in the contract. The court has the power to modify or invalidate unfair terms, and any agreements that contradict this principle are deemed invalid [29, 44].

For example, when an individual purchases a vehicle from an online retailer and agrees to a standard contract for that purchase, any abuse of rights—such as a provision stating that the car cannot be sold for a decade—allows the buyer to seek legal recourse. The court has the power to modify or waive this stipulation and may also initiate a liability claim based on the warranty. This framework is designed to safeguard consumers against exploitation in these agreements, particularly since they take place online. The researchers posit that the majority of online retailers currently utilize standard contracts for their offerings, which consumers are compelled to accept without negotiation, taking advantage of the nature of online transactions. Consequently, it is essential to provide protection for vulnerable consumers to counter any unjust terms that could negatively impact them, empowering judges to alter or nullify any contractual provision to protect the interests of both parties involved.

4 Conclusion

In summary, this chapter offered an in-depth insight into the legal characteristics of online stores through an examination of differing legal perspectives regarding their classification. The findings underscored the significance of differentiating online stores from comparable entities and stressed the necessity of revising the legal framework to keep pace with advancements in e-commerce. Consequently, the study presented actionable recommendations designed to improve legal structures and streamline electronic transactions, thus promoting trust among parties and safeguarding consumer rights. Tackling these matters demonstrates our dedication to establishing a more appropriate and efficient legal landscape in the face of swift digital advancements.

4.1 Results

The study concluded the following results:

1. **Online Store Classification**: An online store may be recognized as a legal entity separate from the trader according to relevant legal frameworks. This distinction improves the safeguarding of both user and trader rights in digital transactions.
2. **Difference Between Online Store and Website**: A website and an online store serve distinct purposes. An online store is designed to directly sell products and services, incorporating e-commerce functionalities, whereas a website may focus solely on delivering information or serving promotional objectives.
3. **E-Commerce Platforms**: E-commerce platforms typically belong to a broader network and provide a venue for selling diverse products from multiple vendors, whereas an online shop may operate independently or within a smaller commercial network that specializes in particular items.
4. **Legal Impact**: The legal classification of an online retailer greatly influences its rights and responsibilities, encompassing issues such as content liability, data privacy, and adherence to e-commerce regulations.

4.2 Recommendations

- **Developing a legal framework**: Developing a legal framework related to e-commerce to keep up with the rapid changes in technology and e-commerce methods.
- **Clarifying legal provisions**: Clarifying legal provisions related to online stores in national legislation to ensure the protection of all parties involved.
- **Consumer protection regulations**: Strengthening the provisions protecting the rights of consumers in electronic transactions, including ensuring security, privacy and protection of personal data.
- **Effective complaint mechanisms**: Developing effective complaint mechanisms to receive and deal with consumer complaints in a lawful and effective manner.
- **Clear responsibilities**: Clearly defining the responsibilities of online stores in e-commerce regulations, including liability for content and compliance with the law.

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Digital Anthropology: Navigating Human Behavior in Virtual Environments



Aref A. Murshed, Ali Alrahamneh, Al-Hareth Alhalalmeh, and Mohammed Al-Badawi

Abstract This chapter is situated within the emerging field of digital anthropology, examining how digital technology influences human behavior in virtual settings. It will explore a range of technological tools, such as virtual reality, social media, artificial intelligence, and networks, and their impact on shaping cultural, social, and political structures, along with individual identities and interactions. Utilizing a qualitative methodology, the research adopts a descriptive approach to review pertinent literature while employing an analytical lens to synthesize insights regarding human navigation within digital realms. Central themes include the significance of perception in virtual environments and the interaction between humans and technology, as well as the broader societal effects stemming from digital engagement. Consequently, this chapter contributes to ongoing discussions about virtual behavior, offering perspectives on ethical dilemmas, the inherent characteristics of digital spaces, and contemporary trends in cyberethnography.

Keywords Digital anthropology · Virtual reality · Human behavior · Social media · Artificial intelligence · Digital ethnography · Cyberethnography · Digital environments · Perception in virtual spaces · Digital culture

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1 Introduction

The field of digital anthropology examines how human behavior has been influenced and continues to be shaped by digital technologies. More precisely, this sub-discipline investigates the effects of these technologies on our actions and interactions as individuals [1]. It encompasses studies related to heritage, gaming, social media, virtual worlds, and the connections we maintain with digital data through AI and machine learning. Furthermore, it addresses how our social, political, and cultural frameworks either promote or hinder the accessibility and utilization of digital technologies and platforms [2]. In simpler terms, digital anthropology seeks to shed light on various forms of virtual behavior. As humanity becomes increasingly immersed in the digital realm, the lines between online and offline behaviors blur, resulting in a reciprocal influence. This chapter delves into, clarifies, and theorizes the implications tied to our identity in relation to digital culture, particularly within the context of virtual reality. We aim to provide a foundation for developing expertise that assists researchers and technical experts in identifying the behaviors and requirements of consumers in virtual reality, as well as their interactions with VR products and digital realms. Additionally, our study reveals how VR can enhance and support human behavior within the digital landscape, while also highlighting how individuals adjust and transform digital settings through technological tools. Furthermore, our analysis intends to clarify the traits of VR as an environment and to shed light on the impact of perception on our experiences and actions within this space.

Indeed, the relatively recent emergence of digital anthropology has made it a subject of contention. The definition of digital anthropology remains elusive, as the themes and objects of study within the field are in constant flux. The term itself carries two referential meanings: one as an adapted form of anthropology and another as related to digital replication [3]. In light of this ambiguity, a more thorough and intentionally skeptical definition has emerged. Digital anthropology can be viewed as an exploration of how digital technologies represent, manipulate, and shape social and cultural relationships [3]. Methodologically, those practicing digital anthropology conduct ethnographic research that considers the social and cultural contexts influencing the development and spread of technologies. This approach reveals a field that is fraught with challenges, open to debate, and wary of technological determinism, favoring detailed examinations of the possibilities for social interactions shaped by aspects of digital systems. It can be asserted from the outset that digital anthropology, henceforth referred to as DA, is clearly differentiated from traditional anthropology [4]. At first glance, the behaviors frequently observed within digital cultures can appear quite peculiar, exemplified by individuals yelling at one another over trivial disagreements. Additionally, many who engage in cyberanthropology are familiar with the concept of multiple selves, which calls for increased caution in their empirically driven methodologies. All interactions on the internet are inherently performative; they serve as projections of the self [5]. However, due to the spontaneous and swiftly evolving nature of virtual exchanges, one's spoken words often fade into the background, becoming merely a reflection of one's representation. Recently, a surge

of research in cyberanthropology has emerged, focusing on three primary themes: the fluidity and contradictions of personal identity, transnationalism and virtual communities, and the phenomena surrounding representation and performativity. It is noteworthy that the interests of cyberanthropology frequently overlap with those found in science and technology studies. Consequently, the research methodologies utilized in this field encompass both virtual and offline ethnographies, interviews, participant observations, and even unsuccessful efforts to engage with cyber-anonymity [6].

1.1 Study Significance

This research plays a crucial role in the developing discipline of digital anthropology, aiding in the comprehension of human behavior in virtual settings. As digital technologies like social media, virtual reality, and artificial intelligence have become integral tools for daily activities, examining their impact on human interactions, behaviors, and identities is highly pertinent. Consequently, this study illuminates how digital spaces influence social, political, and cultural frameworks, while also guiding individuals in distinguishing between online and offline actions. A model for analyzing virtual behavior is essential for understanding how users of virtual reality will reconcile its demands and appreciate the value these technologies add to human endeavors. Furthermore, it explores how VR can enhance human interaction and behavior in digital realms by uncovering the dynamics of relationships between individuals and digital environments. Such insights are crucial for researchers, developers, and policymakers aiming to shape and regulate digital platforms to foster positive social and cultural development.

1.2 Methodology

The methodology employed in this research adopts a qualitative lens to examine human behavior within virtual environments through the framework of digital anthropology. A descriptive strategy is utilized to analyze existing literature concerning human actions, identities, and social structures influenced by digital technologies, including virtual reality (VR), social media, and artificial intelligence. This literature review draws from a variety of sources that explore the effects of these technologies on individual behavior as well as social, cultural, and political dynamics in digital contexts. In addition to its descriptive nature, the review synthesizes and assesses findings to illuminate how human behavior is shaped in these emerging virtual settings. The aim is to identify significant patterns, trends, and challenges in the interplay between humans and technology, thereby offering insights into the ways that human actions are both influenced by and influence VR and digital platforms. Ultimately, the methodology seeks to construct a comprehensive understanding of virtual behavior for both theoretical and practical discourse in the field of digital anthropology.

2 Understanding Virtual Environments

Digital "places," known as virtual environments, allow users to interact with one another and navigate either alone or collaboratively. These computer-simulated social spaces encompass online games, social media platforms, as well as virtual and augmented reality settings. The various types of virtual environments are primarily differentiated by the interactions supported by the technology, which can include 2D interfaces, 3D interfaces, single-user experiences, or multi-user spaces, and are influenced by the hardware utilized [7]. Regardless of the platform or device, community members engage in habitual practices, learn through experience, and develop shared social customs that form what can be described as "cultural expression" within the environment and its social framework. It is essential to view virtual environments as neutral from the beginning, existing as spaces that are neither inherently positive nor negative. As individuals navigate these environments, they must interact with spatial parameters defined by the hardware or software available, which also extend to their bodies and identities [8]. The significance of individuals' interactions within virtual environments expands as actions, time, space, and bodies intersect and influence one another. In this setting, the elements of identity, as well as concepts of presence and absence, become intricately complex and multifaceted. The context in which individual virtual experiences occur is essential for assessing their validity. Analyzing phenomena is supported by studies and various methods that help create a basis for attributing meanings and determining validity.

2.1 Types of Virtual Environments

By 2017, researchers had classified virtual environments into various categories based on their functionality and the level of user engagement. Among the key types identified are electronic games designed for online multiplayer experiences, virtual communities marketed as social networking platforms or multiplayer games that prioritize social interaction, and immersive social interaction spaces created with virtual reality hardware and software that focus on engaging experiences and non-gaming communities. The comparison of these environments reveals a wide range of cultural expressions. The environments we refer to as virtual communities encompass a variety of formats, including text-based and multimedia social settings, electronic games, MUDs, MOOs, and MUSHes, where participants are regarded as real individuals [9]. Some of these environments function as official societies; for instance, the Republic of Iceland has recognized the churches within a persistent World of Warcraft environment as legal and taxable entities, each with its own unique cultures and norms [9]. Participants in virtual environments exhibit distinct differences among themselves in several aspects. When analyzing social networking and VoIP platforms, it becomes evident that these environments can be created and manipulated by administrators, while also being accessible to non-administrative users who lack power

[10]. In these virtual spaces, individuals opt to participate for personal or collective experiences and benefits. Moreover, the demographic engaging with this emerging technological culture likely consists of the most privileged individuals globally, both economically and politically. Their worldviews are probably already aligned with Western perspectives, which diminishes the significance of the conclusions we can draw regarding cultural bias in new systems. This is especially relevant given that current discussions surrounding virtual communities are rooted in speculative evaluations of the early information age rather than grounded in critical, empirical, and data-driven research on the diversity present in various online communities [10]. This indicates that exploring just one dimension of virtual communities is a completely legitimate avenue of inquiry, yet it also necessitates reflection on the conclusions drawn about cultural relativism.

2.2 Key Features

This chapter does not seek to distinguish between virtual and in-person environments. Instead, it emphasizes the unique characteristics of certain virtual settings that impact user interactions. While there is a connection to traditional ethnographic methods, the spaces and places referred to in ethnographies do not share the same overarching attributes [11]. Interactivity stands out as a defining trait of some virtual environments. Conversation is a fundamental aspect of social behavior, and participants in virtual dialogues, like their counterparts in other contexts, exhibit distinct verbal and visual cues that reflect emotional engagement, interaction, and involvement. As a result, an observer can analyze the connections between users in virtual settings across these three dimensions. Anonymity is present in some games but absent in others, and it can significantly alter aspects of social behavior by promoting either trust or betrayal. This anonymity may lead to deviations from established social norms and facilitate experimentation with self-expression and various social identities, such as gender, family status, and social competence [12]. The opportunities for exploring personality and identity in this context can provide valuable insights for the study of culture and virtual communities, particularly due to the variety of experiences in different domains. User-generated content allows individuals to create and develop their own objects, avatars, bodies, and skills within certain virtual environments. While this characteristic of content is present, it is not a defining feature of every virtual game. The designs created through user-generated content are officially distributed as a result. Additionally, the value of a distributed 3D object increases with the volume of data generated around it [13]. However, technology can also isolate users from connecting with others. Engaging with computer technology can often be a solitary endeavor, making studies of online friendships or behaviors less than fully transparent, as the technological element of disconnection is consistently at play.

3 Methods and Approaches in Digital Anthropology

Examining human behavior within digital environments necessitates not only the modification of conventional anthropological techniques but also the creation of innovative ones. Methods tailored specifically for the Internet have been developed to investigate social interactions, behaviors, and activities online [12]. A key strategy involves engaging as a participant observer within online communities, mirroring the practices of traditional ethnographic fieldwork while interacting with virtual spaces [14]. Anthropologists studying how diverse user communities utilize digital tools and environments have collected qualitative data via interviews, surveys, and questionnaires. This anthropological inquiry similarly explores how user preferences are shaped by, influence, and are regulated by the tools and practices employed by software developers and administrators [7]. The aim of Digital Anthropology is to uncover the intricate relationships and disparities between the intentions of creators in the digital realm and the ways in which its users engage with these creations [15]. Furthermore, anthropologists enhance this discipline by adopting a reflexive perspective on digital objects, examining not just their physical attributes but also the relationships and sociotechnical dynamics that contribute to their formation. The presentation of data incorporates the interpretive process, the context of participant interactions, and their personal experiences. Utilizing extensive data techniques similar to those employed by sociocultural anthropologists for examining rich descriptions of social interactions, behavioral trends, and the effects of migration or globalization, there was previously no method for extracting substantial amounts of quantitative data [9]. Even with the apparent abundance of user information, the understanding that individuals are far more than mere numbers significantly influenced the initial data gathering and analytical decisions of researchers in Digital Anthropology [15].

3.1 Participant Observation in Virtual Settings

The effective examination of digital cultural studies largely hinges on a research technique referred to as participant observation. Ideally, this method allows both researchers and fieldwork participants to gain insights into social interactions. There exists a crucial sensibility tied to participant observation within online communities, as each virtual "world" possesses its own unique characteristics [16]. This necessitates a thorough consideration by the researchers regarding the specific attributes of a given virtual environment. Ethically speaking, the guidelines relevant to participant observation in traditional settings are equally applicable to online contexts [8]. One could contend that concerns surrounding anonymity and confidentiality take on heightened significance in digital research due to the simplicity with which computer data can be stored and potentially accessed by individuals or organizations without the consent of participants. When individuals sense they are being observed, their behavior frequently alters, which can pose challenges in social contexts where

researchers aim to comprehend what constitutes "normal," a rather commonplace term [17]. As a result, it is often vital to maintain a discreet presence in various forms of participant observation. Given its personal nature, ethnographic participant observation can uncover insights that other categorical methods may fail to reveal. Various types of relational understanding serve as the foundation for both scientific ethnography and everyday comprehension. When interactions occur in an online environment, the characteristics and implications of these relationships change significantly [2]. This shift is reflected in ongoing discussions surrounding "Virtual Culture" and has been extensively examined in philosophical writings [18]. The advent of electronic media is giving rise to entirely novel behaviors, freedoms, and cultural expressions.

3.2 Interviews and Surveys in Virtual Environments

Interviews and surveys serve as excellent methods for gathering data within virtual environments and worlds. To begin with, since data is typically gathered in the form of transcripts and responses, both techniques are platform agnostic [19]. This allows researchers to collect information from a variety of online platforms as well as video chatting services [6, 17]. Consequently, studies can be conducted across different populations and numerous digital platforms and technologies, enabling long-term examinations of digital communication and user behavior trends over time. Additionally, researchers can take advantage of the potentially high user engagement that accompanies new experiments or research connections established between them and the digital platform or technology [11]. It is also essential for researchers to recognize that the data they gather may encompass various communities and a wide array of digital connections from anywhere within the platform or technology where their recruitment posts or surveys appear [20]. Finally, participants can exhibit ethnic diversity since the research is conducted in the public domain [5]. One benefit of interviewer administration is the ability of the interviewer to request clarifications on specific survey responses from individual participants [1]. This aspect can be crucial for understanding and interpreting answers, particularly since we miss the visual cues and social context that a face-to-face interaction would provide. However, there are drawbacks, including the ethical considerations surrounding informed consent from respondents and the need to guarantee that any data associated with individuals remains confidential [15]. Combining a semi-structured or structured format in a virtual or digital setting poses challenges due to the necessity for questions to be flexible according to the context and their presentation in the digital environment [4]. For instance, straightforward inquiries in surveys might elicit either straightforward responses or reactions filled with sarcasm, satire, and humor, particularly among seasoned data users [10]. Nonetheless, the absence of a face-to-face, serious, or personal question survey does not absolve researchers from adhering to ethical standards regarding respect and appropriate conduct in digital environments and wherever research is conducted [17, 20]. It is essential for researchers to start with respect

and regard for each individual's involvement, ensuring that data is presented in a manner that does not necessitate interruptions or require researchers to address points that participants have not explicitly mentioned. This could involve anonymizing all participants by possibly modifying certain facts or details, including operational descriptions, while refraining from attempting to identify them. Collecting data that includes an individual's identity is illegal [21, 22]. Challenges may arise from technical issues, leading to a restricted amount of data being produced [23]. Conversely, there are instances when the online testing experiment is so efficient that it yields insufficient data. Ethical considerations can also influence the findings [21].

4 Ethical Considerations in Digital Anthropology

The development of digital anthropology is essential, particularly one that directly addresses the unique challenges posed by this innovative approach to ethnographic research [24]. In the following section, some potential responses to these challenges are presented [25]. While this does not constitute a comprehensive set of solutions to all the issues raised, it may help initiate further discussion [22, 26]. Typically, big data analysis occurs online through confidential agreements with commercial search engines [27, 28]. This arrangement carries significant and extensive implications for establishing the parameters of digital ethnography, as search engines possess knowledge of user identities, whereas the public remains largely unaware of who utilizes that data and for what specific purposes [29, 30]. More importantly, users are not solicited for their consent to be treated as subjects by a search engine. Consequently, they become mere objects of financial interest to the creators of the software. Engaging in the pursuit of research participants through such unregulated and unethical methods is simply unacceptable [28]. Additional anthropological issues persist [29]. Given that online human behavior is shaped by various technologies and exists solely due to a complex interplay of forces, it becomes ontologically strange to try to distill this grand complexity into a format that presents itself as a collection of links generated by that specific software [30].

5 Conclusion

This chapter primarily serves as an endeavor to chart the multidisciplinary domain of digital anthropology, underscoring essential themes that may be pertinent for future inquiries into the subject. We began by highlighting the significance of comprehending human behavior within digital contexts, as this is evident in both cultural dynamics and social frameworks. Subsequently, the following sections presented a concise overview of methodologies that are particularly applicable to digital research. These methodologies, rooted in the qualitative tradition, revive certain concepts from

early fieldwork in cultural anthropology, which we now refer to as "cyberethnography." This approach allows for an examination of virtual spaces on their own terms, showcasing aspects such as their three-dimensional nature. We also explored the distinct characteristics of digital anthropology as the premier evolving platform where discussions stemming from cyberethnographic studies emerge. This process facilitates collaborative development and exploration of ideas through an iterative learning and knowledge production cycle, effectively signaling the conclusion of traditional publishing. We wrapped up by initiating a dialogue on the essence of ethnographic digital spaces and probing into the ethical and copyright challenges they present. Indeed, we contend that it is essential for researchers in various fields to cultivate digital ethnography to thoroughly examine its cultural, economic, political, and scientific implications.

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Psychological Resilience in the Digital Age: Coping Strategies for Navigating Technological Stressors



Saed Salah Alfraih

Abstract The concept of psychological resilience, which originated in the physical sciences, has transformed to include the capacity of individuals to adapt and flourish when faced with challenges. In today's digital era, the relevance of resilience has grown as technological stressors, including pressures from social media and digital overload, affect individuals' mental health. This research utilizes a qualitative methodology to investigate psychological resilience amid contemporary technological hurdles. By employing a descriptive approach, the study reviews and synthesizes existing literature on resilience and technological stress, focusing on how individuals cope with and adjust to digital stressors. An analytical method is subsequently used to pinpoint key themes and assess the effectiveness of various coping mechanisms. The findings are intended to offer insights into improving psychological resilience and crafting strategies that assist individuals as they navigate the intricacies of a technology-driven world. Through the integration of empirical findings and theoretical frameworks, this study enhances the understanding of interventions aimed at building resilience and their applicability in both academic and residential contexts.

Keywords Psychological resilience · Technological stressors · Stress management · Positive psychology · Technological challenges

1 Introduction

The concept of resilience is not confined to technology or the digital era; its origins can be traced back to physics, where it initially described the capability of materials to revert to their original shapes after being deformed [1]. Over time, the emphasis has transitioned toward individuals and communities, now encompassing children and

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youth in today's digital landscape. A frequently referenced definition characterizes psychological resilience as the ability to adapt effectively and maintain functionality when confronted with adversity, trauma, tragedy, threats, or substantial stressors—such as issues within families and relationships, serious health challenges, or pressures from work and school, including the negative effects of social media and other technological advancements [1].

The concept of psychological resilience is anything but easy. It does not just label people as either "strong" or "weak," pending terms like "happy" and "sad" or "good" and "bad." Psychological resilience involves the process of adaptation and coping that may be effective to variable extents under many determinants. Moreover, the term "psychological resilience" around the year 2002 started replacing the generic terms "resilience" or "resiliency" [2]. This shift reflects a movement of this basic idea from its conventional use in physical and social sciences toward an emerging emphasis on psychological applications—today quite securely grounded within positive psychology and humanistic psychology.

1.1 Research Significance

For this very reason, the exploration of psychological resilience represents a pressing issue in the context of the current digital era, where technological achievements and influences in the field of digital media have become practically omnipresent. More currently, the term resilience has been shifted from physics to denote the ability of human beings to readjust themselves and prevail in the event of trauma, misery, and anxiety. Given the present challenges on social media, stress at work, and digital communications, it is crucial to ensure an understanding of psychological resilience. This study will be important in drawing out how individuals and communities deal with technological stressors and also the strategies that aid adaptation and general well-being. With a focus on psychological resilience within digital environments, the study will meet the increasing demand for identification and promotion of effective coping strategies that are designed to be in line with specific stressors related to technology. This emphasis does not only enrich the wider discipline of psychology but also helps offer valuable insights for individuals, educators, and mental health practitioners seeking to bolster resilience and effectively manage technological stress. We can take it into an ever-evolving digital landscape by effectively managing and channeling the energy of those potentially highly disruptive emotions.

1.2 Methodology

The present study is a research qualitative work that deals with resilience in the digital era from a psychological dimension, focusing on coping strategies for technology-related stressors. A descriptive approach is taken in this paper in undertaking a

systematic review of literature in relation to psychological resilience and technological stress. This review will involve an examination of scholarly works, empirical studies, and theoretical frameworks that focus on understanding how people learn to adapt to and manage stressors in digital environments. This will then be followed by applying an analytical approach to interpret the results, spot common themes, and evaluate the effectiveness of different coping strategies towards that end. This will be key to understanding how psychological resilience can be developed and enhanced in response to technological challenges. The discussions and their findings resulting from this analysis are expected to provide useful insights into effective coping mechanisms and go a long way in drawing up strategies that help people deal with stressors emanating from the digital world.

2 Psychological Resilience

Indeed, the development of digital technology has completely changed our ways of coexisting, working, or communicating with each other. Technology offers most avenues for socialization, self-expression, professional productivity, and learning. Yet it comes with pressures that are entirely unprecedented and never experienced by other generations. In the context of this work, technological stressors include online abuse and harassment, social isolation, fear of missing out (FOMO), and the expectation to always be on for work [3]. Such pressures can easily give rise to various mental health problems, such as burnout due to information overload and addiction to social networking sites. To develop a healthier relationship with technological artifacts, the focus must shift to the construction of personal and societal resilience. This resilience will help people navigate through the complexities presented by the digital era along with the changing aspects of work and life. For this reason, this chapter delineates a three-tier strategy that intends to build psychological resilience for both individuals and society in the era of digitization.

It is an admirable and extraordinary quality to be able to adapt and surge in the face of the many adversities and challenges that life throws at us [3]. It is not only the ability to bounce back immediately after stress and shock but also a deeper capacity for negotiating and readapting to the long-term sociotechnical changes that keep reshaping our world at large. There are indeed many other important causes in the development and enhancement of resilience within an individual, community, and larger society. Basic personal coping strategies and empowerment skills enable one to weather life's storms with amazing strength and resolve [4]. Moreover, it becomes a literal beacon that can show one's way through very dark journeys when lighted with a generally positive psychological and emotional outlook. Thirdly, strong and diverse support networks, composed of individuals who are caring but at the same really self-reliant in their own right, give the foundational strength one needs during turbulent times. Such steady presence and support lend much reassurance and inspiration at impetus to be resilient when the chips are down. Besides, building community connections and trust is of paramount importance. When people are

bound together by common basic trust and mutual support, then they can withstand even the most challenging circumstances and come out stronger than ever. The central aspect of developing resilience is the sense of social belonging and opportunity to make a difference. Those who feel connected and have a sense of belonging with their communities are more likely to bounce back from adversities and contribute proactively to improving common well-being. This shared sense of purpose and collective resilience creates a synergy that propels both individuals and communities forward even when facing seemingly insurmountable odds. It is important to realize, however, that resilience is far from static or an inherent quality [4]. Rather, it is not static but a dynamic and fluid capacity that evolves continuously and needs renewal and maintenance even in times of stability and growth. Just like your favorite piece of clothing, resilience may wear out from prolonged exposure to stress, be weakened by continual adversity, and, ultimately, lost if not regularly tended to. Also, figuring out who has resilience and who needs help is very relative and has deep dependence on the context. What makes one person resilient in one set of circumstances might not hold true for another individual going through an entirely different life situation. Understanding this, therefore, means an understanding that resilience acts as a sensitive compound of interaction among people, communities, and their diverse environments—really important to make it through all challenges [5]. Resilience is truly an amazing ability because it is never static but dynamic that assists individuals, communities, and nations in bouncing back from adversities. It is built on effective individual coping strategies plus positive thinking, a good support system, connections within one's community, trust, and common purpose [5]. That said, it is important to recognize that resilience is fluid and needs to be refreshed and maintained over time. In the final analysis, resilience manifests uniquely in all walks of life, underlining the rich tapestry that represents the human experience.

3 Understanding Technological Stressors

With the ongoing advancement and widespread integration of digital technology into our personal and professional spheres—accelerated by globalization and the recent COVID-19 pandemic—there has been a growing dependence on and exposure to various digital artifacts, which can be both advantageous and harmful [6]. The digital artifacts and mediums utilized in information and digital technology, such as hardware, software, and websites, along with the information systems, socioeconomic frameworks, and environmental structures influenced by these technologies, together form a socio-technical system. These socio-technical systems generate digital stressors. Accompanying digital technology are significant factors that contribute to these stressors, including extended work hours, the erosion of boundaries between work and home life, and the rise in communication and cyberloafing facilitated by information and communication technology (ICT) [6].

Due to the lack of widely accepted definitions in behavioral science, the understanding of digital stressors has been explored through other fields, including

ergonomics and information systems (IS) research. For example, one definition indicates that digital stressors encompass a range of psychosocial and physical demands encountered when engaging with digital artifacts and the associated socio-technical systems. Another definition posits that these stressors arise from the interactions and services provided by digital and information technologies integrated within a sociotechnical framework [7]. From the perspective of IS, digital stressors are identified by a series of negative impacts linked to the interactions between digital and information technologies and their socio-technical environments, which are experienced across technological, organizational, physical, and cognitive dimensions.

Technological stressors originate from a variety of sources and can produce numerous effects [8]. They may be external, such as the demands of email or messaging features that blur the lines between work and personal time, or remote work that compromises work-life boundaries. Internal stressors also exist, reflected in the troubling thought patterns that can emerge from problematic technology usage. Additionally, these stressors can take on different forms, affecting individuals both personally and professionally. For instance being always connected to digital devices can result in increased levels of anxiety and decreased productivity. Moreover continuous exposure to digital content acts as an amplifier for feelings of isolation and social comparison which leads to negative mental health consequences. Another aspect is the routine activity dependency that establishes a sense of reliance thereby increasing stress and frustration when one faces technological challenges [8]. It, therefore, becomes very important for individuals to develop effective coping strategies that can address the technological stressors sustaining their overall well-being in the current age of digital evolution. With the above observations, we can understand that AI-written content tends to have some quirks, such as coming across as disconnected, lacking tone, and feeling somewhat unpolished.

Many stressors implicit with technology use of many cases revolve around being exposed to very discouraging information, the perpetual comparison of oneself to an unrealistic standard and to unattainable goals, isolation from authentic connections, and interruptions to truly productive (or) truly enjoyable pursuits. It is crucial to note that overlooking or dismissing these stressors as if they don't exist will not make them vanish or resolve [9]. Rather, it is more important to be aware of them and address these issues directly by implementing effective strategies towards a healthier and balanced way of interacting with technology.

In communities where technology is highly valued for connection, empathy for problem experiences and addressing their root causes isn't really a need. It is overdue. As it turns out, our comprehension of psychological resilience from the viewpoint of individuals adept with technology might need to deepen in such a rapid and technology-driven environment [9]. This approach is what would enable us to provide key support and guidance to those lacking the appropriate tools, resources or insights to manage technology-related stress effectively. More so, we need to broaden our empathy and support so as to empower individuals as they navigate the complexities of our ever more interconnected world.

4 The Impact of Technological Stress on Mental Health

There is no doubting that we belong to the information age, with technology touching our daily lives in so many ways. While it may be indispensable for people and societies, digital technology has also brought about the phenomenon known as technological stress that serves to describe strain resulting from the use and abuse of these innovations [10]. Technological stress is the negative influence that digital technologies have on an individual, evidenced by high levels of depression, fatigue, stress, and a range of psychological problems such as anxiety, panic attacks, aggression, emotional fluctuations, and decreased mental stability. This kind of stress may result from changes in the digital landscape, feelings of being overloaded due to a lack of time, and difficulties with maintaining real-world relationships in a technological communication environment [10]. The notes were prepared by researchers at American University in Washington, D. C. The bibliography also includes an index of over 70 web sites that contain information about telecenters, including what they are, what they do, where they are located, who uses them, benefits and common problems associated with them, an international perspective on growth and success stories, and links to other specific telecenters around the world [11]. As digital technology is integrated into the fabric of daily living, including social interaction, work, and e-learning for the younger population, understanding the concept of digital stress becomes a major issue for older adults, younger generations, and learners. In addition to this, young adults who frequently use mobile phones and those highly skilled in using the Internet report rather high levels of psychological well-being. Moreover, with stress related to mobile phone use being above average among students, it could create an imbalance in psychological well-being; this affects mental health problems and quality of life in general. Therefore, it is of great importance that students understand and adequately control technological stress to act in their own mental health problems [12].

Anxiety and mood disorders, such as depression, rank as the most frequently diagnosed mental illnesses among humans. These conditions are characterized by their intricate and elusive nature, along with their overwhelming prevalence. Defining them precisely proves challenging, and the line between normal behavior and pathological functioning often becomes indistinct. The origins of these disorders seem as varied as the symptoms they produce [13]. Additionally, their emergence and progression typically involve a complicated interaction between biological factors and psychological or psychosocial influences. Recent epidemiological studies have revealed a troublingly high incidence of these disorders among young individuals, both prior to and following their entry into college or university. It is vital to recognize that mood disorders, particularly depression and anxiety, can adversely affect various aspects of wellness and functioning. These negative effects can extend to physical health and academic performance. Students grappling with these disorders may struggle to maintain their overall well-being and fully achieve their academic potential. Therefore, it is crucial to address and manage these mental health issues effectively. By offering essential support and resources to those dealing with anxiety

and mood disorders, we can foster their overall wellness and enhance their success in academic pursuits [13].

The current literature reveals a significant emphasis on the mechanisms of stress response and their relevance to children and adolescents [14]. In particular, anxiety stands out as a major concern when examining stressors linked to technology. The onus of ensuring digital safety and encouraging responsible use largely rests with parents and guardians for children. Thus, it can be posited that anxiety is likely to present itself predominantly as a mood or mental health symptom within this demographic, especially due to issues like cyberbullying or unintentional exposure to disturbing or inappropriate material, such as pornography or graphic violence. Numerous studies have highlighted the harmful effects of fear, indicating that it leads to a variety of adverse health outcomes [14]. These outcomes include anxiety, sleep pattern disruptions, feelings of helplessness and loss of control, irritability, and anger. It is essential to recognize that these symptoms can worsen existing mental health challenges. Supporting these observations, a survey conducted among this same age group indicated that negative emotional repercussions, particularly fear and anger, were commonly reported following adverse online experiences. Such emotional repercussions further intensify the overall effects of technology-related stressors on the psychological health of children and teenagers [15].

5 Coping Strategies for Navigating Technological Stressors

This section presents four strategies grounded in evidence that assist individuals in managing stress while facing the difficulties of the digital landscape. These approaches, informed by research on social support networks, examine how individuals leverage their face-to-face relationships, online connections, and self-awareness to mitigate adverse emotional impacts. Additionally, the author discusses ways in which scholars can incorporate these methods into the achievement of set treatment objectives, such as alleviating symptoms or enhancing a person's social ties and involvement with community institutions. Lastly, the author addresses the limitations of the study and points out areas for future research on the topic [16].

1. Cultivating in-person support systems. Therapists are essential in helping their clients develop empowering tools that facilitate the creation of strong local support networks. These networks act as crucial resources, enabling individuals to engage with others in person and experience the significant benefits of face-to-face support. This connection not only aids in reducing stress but also improves one's capacity to recover from challenges, promoting increased resilience [17]. As therapists assist their clients through this journey, they can monitor the development of these networks and offer important advice on nurturing and reinforcing these relationships for sustained growth and satisfaction.

2. Engaging clients in online support systems. Therapists have the ability to create online support networks, recognizing that such platforms offer a quick, convenient, and easily accessible safety net for their clients. It is vital for therapists to motivate clients to investigate different social media platforms and to educate them about these sites, particularly if they are not well-versed in their use [18]. This exploration allows clients to connect with others who have similar hobbies, interests, or experiences, promoting a sense of belonging and understanding. Numerous studies have clearly shown that involvement in these online social activities can significantly enhance a person's overall mental well-being. As a result, participation in these networks may help reduce and ease stress levels associated with technology, empowering individuals to live healthier and more balanced lives [19].
3. Attention regulation practices such as mindfulness and meditation enhance the ability to disrupt stress cycles and improve overall functioning. Originating from ancient religious traditions, mindfulness is characterized as "the awareness of one's experiential process in the present moment with an attitude of non-judgment, openness, and acceptance" [20]. On the other hand, meditation is the structured practice aimed at achieving the mental state associated with mindfulness. Both approaches employ a range of techniques that naturally engage mind-body connections and highlight the significance of remaining present [21]. Recent studies indicate that dedicating just ten minutes a day to mindfulness meditation can lead to decreased stress levels, enhanced overall wellness, and lasting changes in brain activity. Engaging in mindfulness practices has also been shown to boost self-compassion, emotional regulation, cognitive flexibility, empathetic responses, and cognitive abilities, including executive function and working memory. With technology usage among adolescents reaching unprecedented levels, mindfulness and meditation are increasingly recognized as effective interventions for digital stress. Mindfulness training programs have been implemented to equip individuals with skills for self-regulation, relaxation, and emotional well-being [22, 23]. Consequently, numerous secondary schools have focused on these programs to mitigate the significant effects of technology and social media on students [24]. Designed to help children learn self-monitoring and calming techniques, these wellness initiatives have proven particularly effective in tackling the social connections and online validation, such as downloads and likes, that children seek [22, 25].
4. Mindfulness practices are delivered in an engaging and interactive way through intervention programs, utilizing games, group discussions, and role-playing activities. It is believed that these approaches alleviate both generalized anxiety and technology-related anxiety, as well as depression and impulsivity, by improving cognitive and emotional functioning [26]. Positive results have been observed among young adults participating in mindfulness and meditation interventions, such as enhanced social interactions stemming from greater empathy and better emotional regulation. Additionally, noteworthy outcomes include improved academic performance, which is linked to increased attention and

memory from consistent participation in mindfulness and meditation programs [27].

6 Conclusion

This article has examined a significant amount of empirical research conducted over the last thirty years, aimed at uncovering the factors that contribute to psychological resilience within the general population, as well as assessing the effectiveness of interventions designed to enhance resilience. Additionally, it has utilized Grizzell's proposed positive psychology theory to inform approaches for tackling the challenges that arise from the widespread use of digital devices in academic and residential settings at colleges and universities. Based on the insights gained from this research, there is hope that parents, colleges, and universities will acknowledge the importance of creating and executing strategies that foster and sustain psychological resilience among their students amidst the rapidly changing technology-driven landscape. The multitude of stressors faced by students residing in college and university dormitories during this technologically rich twenty-first century can be daunting, resulting in a heightened risk of mental health issues. Grounded in the concept of psychological resilience, several of our studies have aimed to pinpoint the psychological factors that most effectively mitigate the effects of stressors on psychological distress and physical health symptoms, while also comparing the effectiveness of promoting "positive" psychological health against traditional psychotherapeutic methods. Our findings have highlighted the crucial and consistently positive influence of psychological resilience in moderating the effects of stressors on student outcomes.

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Intelligent Computing in Artificial Intelligence Based on Neural Inspiration



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Abstract The astounding computing powers of the human brain have long captivated artificial intelligence (AI), but simulating these complex functions in AI systems continues to be a formidable obstacle. The intricacy of human brain computation surpasses existing AI capabilities due to its networked neurons processing information in parallel and its superior ability to learn from sensory inputs. Researchers have created a number of techniques and algorithms, including as neural networks, deep learning algorithms, and cognitive modelling approaches, to close this gap. The A3S (Arwin-Adang-Aciek-Sembiring) method is one such cutting-edge strategy that aims to mimic human brain computation for knowledge acquisition. The A3S approach continuously refreshes the system's knowledge by recursively digesting sensory inputs.

Keywords Arwin · Adang · Aciek · Sembiring · Health services access · Scientific and technological progress

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1 Introduction

Neural networks are being used in artificial intelligence applications to simulate cognitive processes and enhance machine learning capabilities [23]. The Research on intelligent agents has a long history, gaining momentum in the mid-1990s. An agent, in real-life contexts, is a factor that significantly influences a situation. To exert this influence, an agent requires certain capabilities, including task management, spatial awareness, task execution proficiency, task success evaluation, and understanding of task consequences. Human agents possess these capabilities inherently through sensory organs like eyes, ears, nose, tongue, and skin, as well as limbs for action [1, 2]. Central to an agent's functioning is the brain, which processes information, distinguishing humans uniquely in this regard [1].

Agents continually perceive their environment to gather information crucial for their activities. This information undergoes processing in the brain, involving assimilation with existing knowledge, inference generation, knowledge integration, decision-making, and action selection. While intelligence is often attributed to agents, defining an agent remains a challenge [2]. However, autonomy, or self-governance, is widely regarded as an essential trait [3]. Self-governance implies an agent's ability to direct itself in task execution and self-assess task completion for future improvement [4].

The cognitive process within the human brain, involving sensing, inference, decision-making, and action, is encapsulated in the SIDA (Sense-Inference-Decide and Act) cycle, representing a perpetual cycle of decision-making [5]. Information processing is continual as long as humans live, driven by sensory input [6]. In the inference and decision formulation phase, information from multiple sensors is prioritized for comprehensive understanding, requiring fusion before inference generation [7].

The process of inference, distinct from inferencing, involves deriving conclusions from evidence or premises, while inferencing entails deriving meaning from context and prior knowledge. Both terms find application in various fields, including Artificial Intelligence (AI) [8]. Inference contributes to the accumulation of new knowledge in the brain, vital for anticipating future phenomena sensed by sensory organs, a process termed knowledge extraction [9].

The brain, as a living information processor, exhibits remarkable intelligence, inspiring extensive research across diverse disciplines such as psychology, informatics, electrical engineering, mathematics, and social science. This interdisciplinary interest has led to the emergence of Artificial Intelligence (AI), aiming to understand and replicate human intelligence [10].

This paper aims to elucidate a fraction of the mystery surrounding human intelligence, particularly the computational mechanisms within the brain for knowledge acquisition and problem-solving.

2 Literature Work

A. Paradigms of Information Processing Systems

The theoretical construct of information processing systems mirrors human cognitive development through an analogical prism of computational machinery [11]. Analogous to computational paradigms, human cognition engages in the manipulation of informational constructs to navigate cognitive problem-solving domains [12, 13]. The developmental trajectory is elucidated through an evolutionary lens, manifesting as transformations in mnemonic storage capacities and the deployment of heterogeneous cognitive strategies [7, 14]. Information processing, delineated as the quintessential orchestration of information acquisition, encoding, storage, retrieval, presentation, and dissemination, permeates multidisciplinary boundaries, traversing the corridors of psychology, social sciences, and sports sciences [8, 15]. Herein, we shall delineate three pivotal models within the landscape of information processing: the Wickenian framework, the Welfordian schema, and the Whitingian paradigm.

1. The Wickenian Model:

Wicken delineates the hierarchical edifice of human information processing into a septenary architectural construct, encompassing sensory processing, short-term sensory memory, perceptual encoding, decision-making and response selection, response execution, feedback and information flow modulation, and attentional governance. This model serves as a foundational primer [15], furnishing a pedagogical exposition on the rudiments of cognitive science, germane to the exigencies of Human Factors design, especially in the aeronautical domain [16].

2. The Welfordian Paradigm:

Welford's magnum opus unveils a tripartite ontological schema, comprising the stages of stimulus identification, response identification/selection, and response programming [17]. It encapsulates the ontogeny of sensory inputs, short-term and long-term memory substrates, decisional heuristics, and motoric effector mechanisms [18]. The decision-making apparatus is underscored by the translational nexus from perceptual input to actionable output, orchestrated by effectorial modulations, catalyzing responses to extrinsic stimuli [19].

3. The Whitingian Framework:

Whiting's opuscule, unveiled as a foil to Welford's edifice, proffers a heptagonal schema, embellished with nuanced modifications, including modalities such as inputs, data receptors, perceptual conduits, translational matrices, effectorial machineries, outputs, and feedback loops [20]. The crux of this model resides in the expeditious processing of perceptual inputs through translational mechanisms, culminating in the epistemological scaffolding for effectorial execution [21].

2 Epistemological Constructs of Knowledge Generation

The ontological inquiry into the genesis of knowledge has been a perennial preoccupation amongst erudite luminaries, exemplified by the seminal contributions of Seymour Papert, Jean Piaget, and Lev Vygotsky. Despite their methodological divergences, they converge upon the epochal construct of constructivism [22]. This paradigm posits that knowledge is a confluence of experiential enculturation, catalyzed by a dialectic interplay between cognition and context [1, 23]. Constructivism, in its metatheoretical compass, avers that human cognition is a dialectical process of ideational synthesis, precipitated by cognitive encounters with disparate epistemic constituents [24]. In its didactic instantiation, constructivism undergirds pedagogical praxes, engendering an empyreal terrain for the cultivation of epistemic efficacies, especially in the domain of educational pedagogy, now interfacing with the vanguard of Artificial Intelligence (AI) [25].

(1) Psychological Ontogeny:

The terrain of psychological inquiry enunciates a constellation of cogitative models, endeavoring to limn the contours of human inferential architectures, with a hermeneutic gaze towards the formulation of a Human Inference System (HIS) [8]. In the scholarly terrain, extant models, albeit predominantly focused on the rubric of information processing, proffer incipient insights into the modus operandi of cognitive accretion within the HIS paradigm.

(B) Mathematical Heuristics:

The heuristic trajectory of human cognition bespeaks a veritable mosaic of evaluative judgments, poised at the fulcrum of probabilistic ratiocination [13, 26]. The cognitive architecture, in its aleatory predilection, espouses a probabilistic epistemic veneer, accentuated by the veneration of Bayesian inferential paradigms, emblematic of epistemic parsimony [21, 27]. The Bayesian heuristic, emblematic of the Bayesian inferential apparatus, proffers an inferential alchemy, engendering a mélange of hypotheses, subsumed beneath the imprimatur of maximum a posteriori (MAP) estimations, orchestrating an epistemic crescendo of optimal hypothesis selection amidst a phalanx of plausible conjectures.

3 Syncretic Confluence of Information Fusion

The leitmotif of information fusion crystallizes the syncretic confluence of disparate informational streams, coalescing into a gestaltic whole, facilitating cogitative praxes in a panoply of ontogenic exigencies [21]. The cognitive architecture, enshrined in its epistemological citadel, converges upon the transcendental alchemy of information fusion, an ontological crucible wherein cognitive accretion burgeons through the alembic of sensory stimuli. The cognitariat, ennobled by its sensorial modalities, gleans epistemic kernels from the kaleidoscopic montage of sensory inputs, interspersed with multivariate inputs, emanating from the crucible of interpersonal discourse [28]. The cognitive vanguard, enshrined within the sanctum sanctorum of human experientiality, effloresces through the alchemy of information fusion, precipitating the epistemic ascendancy of the human cognitive edifice [22].

3 Propoased System

Brain-Inspired Intelligent Computation

This section unveils a novel model that amalgamates human information processing and fusion models, alongside a computational approach for knowledge augmentation, illustrated through a computational demonstration [6, 28]. Our research delves into a nascent domain termed "knowledge- growing," yielding two innovations: the conceptual framework of Knowledge-Growing System (KGS) and the A3S method for knowledge augmentation within KGS in Fig. 1.

A. Human Inference System (HIS) Model for KGS

Drawing upon human information processing and fusion paradigms, our HIS framework underpins the cognitive architecture of KGS. In this construct, we posit that novel information stems from fused sensory inputs. Grounded in the HIS concept, we generalize the framework to a system endowed with an array of sensors, each contributing to a fusion of information streams. Based on HIS concept, we generalize the model to a system that is equipped with a set of sensors $\boldsymbol{n} = 1,\ldots,\boldsymbol{i},\ldots\boldsymbol{\delta}$. Therefore, the number of fused information is λ, so the number of fused information can be obtained by using the equation

$$\lambda = \left(2^{\delta} - \delta\right) - 1$$

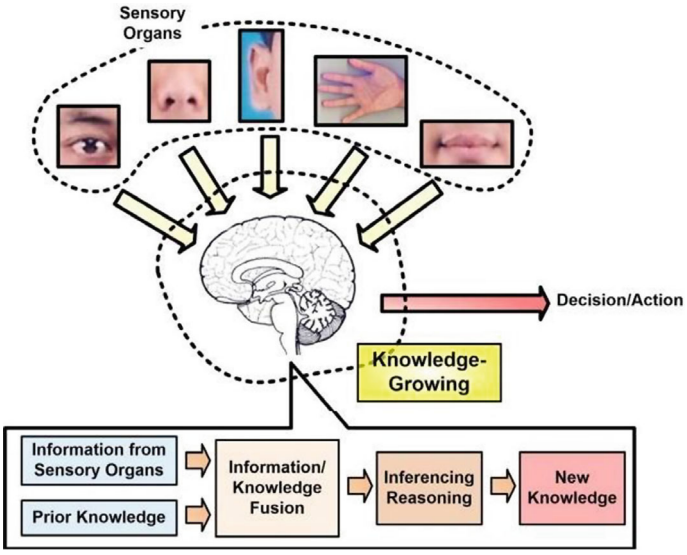


Fig. 1 Human information fusion system [21]

Each fused datum engenders inferential outcomes, which, if sufficiently robust, crystallize into new knowledge, thus elucidating observed environmental phenomena.

2 Knowledge-Growing Mechanism—Emulating Human Cognition

Within the SIDA cycle, the inference and decision formulation phase embodies the knowledge-growing mechanism, wherein new information integrates with existing knowledge to engender fresh insights. The algorithmic schema for this mechanism is delineated, wherein a plethora of sensor inputs (δ) and hypotheses (λ) converge to yield a probabilistic inference (DoC), representing the system's confidence in a particular hypothesis in Fig. 3. The evolution of knowledge over time is facilitated through the OMA3S method, ensuring a dynamic knowledge landscape reflective of the observed phenomena.

3 Knowledge-Growing Mechanism—Emulating Human Cognition (Continued)

Rational action, epitomized by maximizing performance in light of perceptual evidence, underscores the cognitive endeavor. The acquisition of knowledge across multiple observation times, facilitated by OMA3S [16] in Fig. 2, enriches the cognitive schema, enhancing the system's ability to discern and interpret complex phenomena.). Actually in the beginning it knows nothing about the phenomenon. The knowledge acquired in one-time observation to it can be measured using the MAP decision rule, which selects the hypothesis with the highest individual probability. The notation () represents the fused probability of all a posteriori probabilities, with "estimated" indicating the selected fused probability as the most likely hypothesis.

$$DoC_{\gamma_i} = \left| P(\theta_j)_{etimate} - \phi_i^j \right| \times 100\%$$

4 Experimental Results

Our research explores the application of CognitiveAI, a novel observation time is carried out by using OMA3S in order to ensure sufficient knowledge has been acquired to recognize it.

The quality of the grown knowledge is measured using

$$DoC_{\gamma_i} = \left| P(\theta_j)_{etimate} - \phi_i^j \right| \times 100\% \tag{3}$$

4 Computation Example of A3S Method—Brain-Inspired Intelligent Computation

This section furnishes an illustrative example of the A3S method in action, focusing on extracting knowledge from observed patterns [29]. Conducted within an Indonesian national research institution, the endeavor entailed developing an

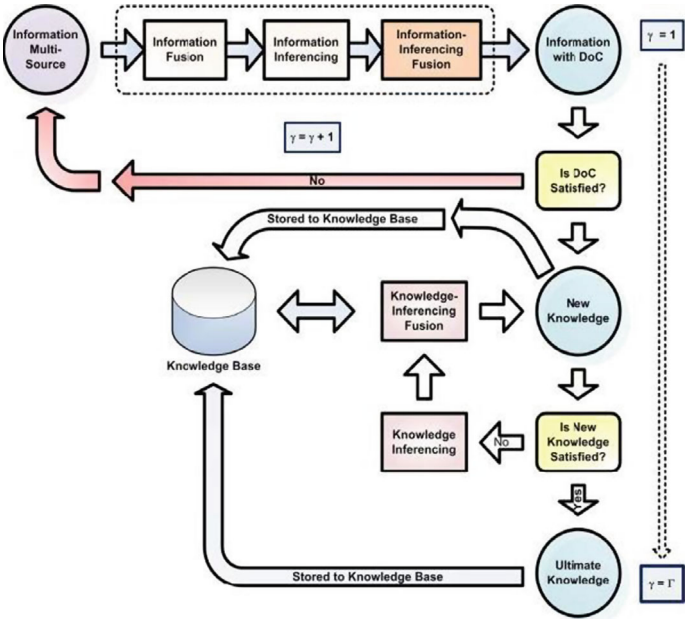


Fig. 2 Knowledge growing mechanism for brain-inspired KGS [13]

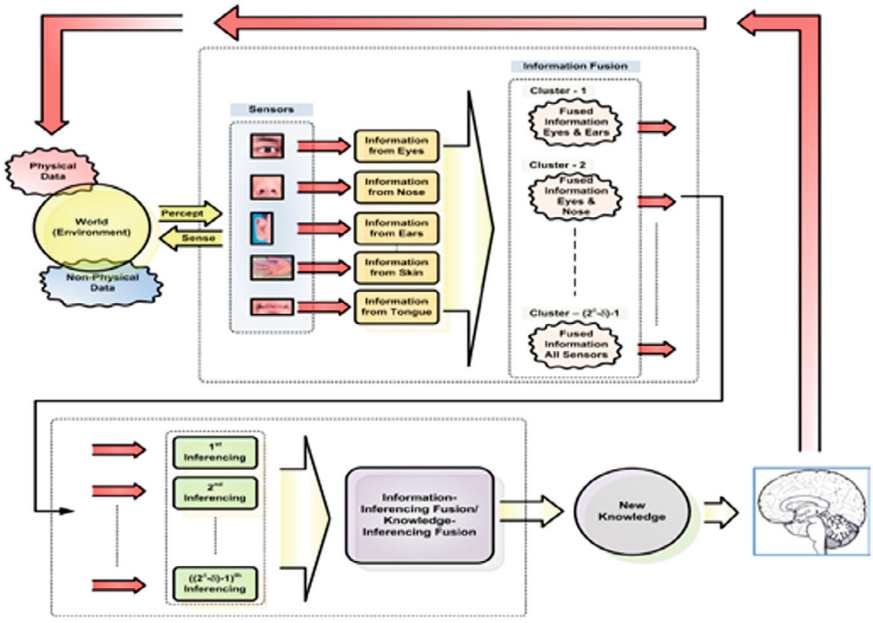


Fig. 3 Human inference system (HIS) model as the basis for KGS [22, 25]

intelligent information fusion system tasked with discerning patterns from sensed phenomena [7, 22]. The system, comprising 42 sensor indications and 8 hypotheses, operates by iteratively analyzing observed patterns to derive novel insights [23]. The computational demonstration showcases the system's efficacy in generating New Knowledge Probability Distributions (NKPD), thereby facilitating informed decision-making [24].

Human cognition often involves weighing information before reaching conclusions, suggesting a probabilistic approach to decision-making [25]. When people think, they reason to establish beliefs or certainty, often quantified as Degree of Belief (DoB), Degree of Plausibility, Degree of Knowledge, or Degree of Certainty [17, 26]. Belief or certainty, as new knowledge, may be derived directly or through deductive or inductive reasoning, with probability theory playing a crucial role in handling uncertainties [27].

Probability-based methods, like Bayes Inference Method (BIM), are widely used, with BIM being a mature technique in AI [28]. BIM computes all possible hypotheses given a fact and selects the best hypothesis using techniques like Maximum A Posteriori (MAP) estimation [29]. Human reasoning aligns with a complex version of BIM, reflecting the probabilistic nature of human thinking [30].

BIM is well-suited for single-data scenarios, but decision- making often requires consideration of multiple data points for precision [31]. For such cases, an enhancement to BIM, known as the Maximum Score of the Total Sum of Joint Probabilities (MSJP) method, was introduced [32]. The MSJP method aggregates the joint probabilities of all hypotheses and facts, selecting the hypothesis with the highest combined probability as the most likely outcome [17, 26, 33]. This approach contrasts with approach to intelligent computing in artificial intelligence, inspired by neural principles [34]. In this study, we have investigated the use of reinforcement learning to enhance the capabilities of CognitiveAI systems [14, 35].

We have demonstrated the effectiveness of reinforcement learning in training CognitiveAI models, using a car navigation scenario as an example [36]. In this scenario, the CognitiveAI [3, 37] model learns to navigate a virtual environment by receiving positive marks for correct turns and negative marks for incorrect turns [38]. Through this reinforcement learning process, the model improves its navigation skills over time [39].

One of the key findings of our research is that reinforcement learning can significantly enhance the performance of CognitiveAI systems in Fig. 4 [40]. By continuously learning from feedback, these systems can adapt to new environments and tasks, ultimately improving their overall reliability and trustworthiness [41].

In conclusion, our findings suggest that CognitiveAI, based on neural inspiration and powered by reinforcement learning, holds great promise for advancing the field of artificial intelligence [42]. Further research in this area could lead to the development of more intelligent and adaptable AI systems, with a wide range of potential applications in various industries [43].

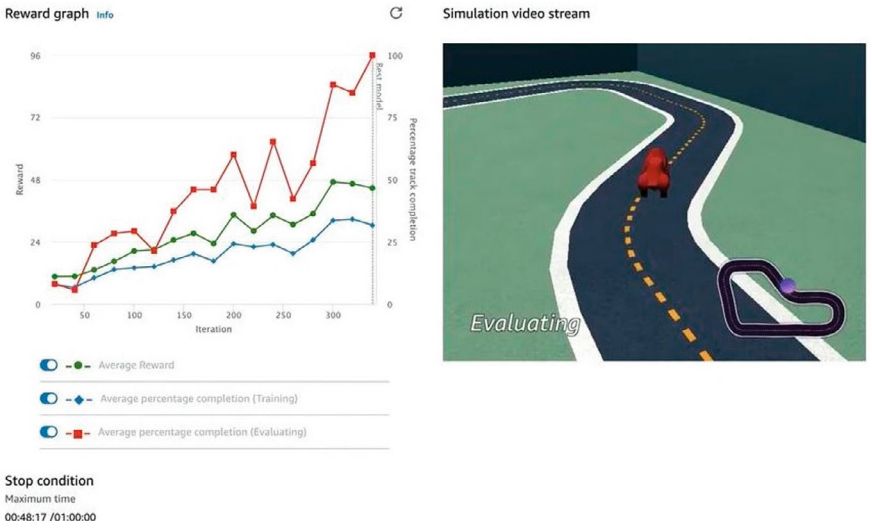


Fig. 4 Training of model by reinforcement learning

5 Conclusion

In conclusion, our research has demonstrated the effectiveness of Cognitive AI, an innovative approach to intelligent computing in artificial intelligence, inspired by neural principles. By incorporating reinforcement learning into Cognitive AI systems, we have shown that these systems can learn and adapt to new tasks and environments, ultimately improving their performance and reliability.

The A3S method, which emphasizes continuous assessment, adaptation, and action, has proven to be a valuable framework for implementing CognitiveAI systems. Additionally, the KG method, which leverages knowledge graphs for enhanced knowledge representation and reasoning, has further augmented the capabilities of CognitiveAI systems.

Our findings highlight the importance of reinforcement learning in enhancing the performance of CognitiveAI systems. By providing feedback in the form of positive and negative marks, reinforcement learning allows these systems to improve their decision-making abilities over time, leading to more reliable and trustworthy outcomes.

Furthermore, our research demonstrates the practical application of reinforcement learning in a car training model scenario. By rewarding correct turns and penalizing incorrect turns, we have shown how reinforcement learning can be used to train models effectively and improve their performance. This example illustrates the potential of reinforcement learning to solve complex problems and enhance the capabilities of Cognitive AI systems.

Overall, our research underscores the significant potential of Cognitive AI in advancing the field of artificial intelligence. By combining neural inspiration with

advanced computing techniques such as reinforcement learning, the A3S method, and the KG method, CognitiveAI systems can achieve higher levels of intelligence and adaptability, paving the way for a new era of intelligent computing.

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A Comparative Analysis of Cyber Vulnerabilities Across Relational, Document, and Cloud Databases



Shibam Karmakar, Hemraj Shobharam Lamkuche, R. Ganeshan, Ashraf Shaqadan, and Sameh Taqatqa

Abstract In this comparative study, we examine the security structures of three prominent database types: relational databases, document databases, and cloud databases. Relational databases, the oldest and most widely used, rely on tables to store structured data, employing security measures like user authentication, authorization, and encryption. Document databases, designed for unstructured data, often used in web applications, employ access control lists (ACLs) and role-based access control (RBAC) to manage data access. Cloud databases, hosted by providers like AWS and Azure, offer scalability and flexibility while implementing standard security features and additional measures like network isolation and data encryption at rest. The study comprises three sections: the first detailing the security structure of relational databases, the second discussing document databases, and the third focusing on cloud databases. The study concludes by comparing the strengths and weaknesses of each database type in terms of security and offering recommendations for enhancing their security measures.

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Keywords Relational databases · Document databases · Cloud databases · Security structures · Encryption · Technological progress

1 Introduction

Relational databases, document models, and cloud databases are three of the most popular database types in use today [1]. Each type has its own strengths and weaknesses, and the best choice for a particular application will depend on a variety of factors, including the type of data being stored, the required performance and scalability, and the security requirements [2]. The selection of a suitable database type, be it relational, document model, or cloud-based, is contingent upon various factors, encompassing data type, performance demands, scalability requirements, and security prerequisites [3]. While relational databases exhibit a well-established security framework with features like access control, data encryption, and auditing, their complexity in configuration and security vulnerability management can be challenging [4]. Document models, on the other hand, offer simplicity and scalability but may lack certain security attributes such as encryption and auditing, owing to their relative novelty [5]. Cloud databases, whether relational or document-oriented, present advantages like scalability, cost-effectiveness, and streamlined management, yet they introduce fresh security complexities involving data privacy and regulatory adherence [6]. Security analysis entails the systematic identification and evaluation of security risks within a database system, employing techniques [7].

such as vulnerability scanning, penetration testing, and risk assessments. Security comparison involves evaluating and contrasting the security attributes and capabilities of different database systems, aiding in the selection of the most appropriate database type for a given application or highlighting areas necessitating security enhancements [8, 9]. In an era defined by the exponential growth of data and the ever-increasing importance of safeguarding sensitive information, the choice of a database system has become a critical decision for organizations across the globe [10, 11]. As the technological landscape continues to evolve, two prominent database models have emerged as front-runners in the race for data security and management: relational databases and document model databases [12, 13]. Furthermore, the advent of cloud computing has introduced a new dimension to this equation, as organizations now have the option to host their chosen database systems in the cloud [14]. In this comparative security study, we embark on an exploration of these two database models—relational and document model—within the context of cloud databases [15]. Our objective is to dissect the intricacies of these systems and their inherent security features, scrutinizing their strengths and vulnerabilities in an effort to assist organizations in making informed decisions that not only align with their data management needs but also fortify their defense against the growing threat landscape of the digital age [16]. By delving into the nuances of each database model and assessing their security within the cloud, we aim to shed light on the most effective and secure data management strategies for contemporary businesses [17]. Relational databases

and document databases are two of the most popular database models used today [18]. Relational databases have been the traditional choice for storing and managing structured data, while document databases are becoming increasingly popular for storing and managing semi- structured and unstructured data [19]. Cloud databases are a type of database that is hosted and managed by a cloud computing provider [20]. They offer a number of advantages over traditional on-premises databases, such as scalability, elasticity, and cost savings [21]. Relational databases, document databases, and cloud databases all have different security structures [22]. It is important to understand the security strengths and weaknesses of each type of database when choosing the right database for your application [23]. This comparative study underscores the multifaceted nature of security structures in relational databases, document databases, and cloud databases [24]. Understanding the nuances of their security features is imperative for selecting the most suitable database model based on the security requirements of a given application [25].

2 Importance

It is important to compare database models in terms of cybersecurity, cyber-attacks, and cyber threats. This information can help organizations, scholars, and cybersecurity practitioners choose the right database model for their needs, while also understanding the security risks involved [26]. This research is focused on a comprehensive comparative analysis of database models within the context of cybersecurity, aiming to shed light on their distinct security attributes and vulnerabilities [27]. By identifying these vulnerabilities and conducting risk assessments, it seeks to evaluate the potential impact of cyber threats on data integrity, confidentiality, and availability [28]. Additionally, it examines the security mechanisms, encryption methodologies, user access control, and authentication systems inherent to each database model. Assessing compliance alignment, update management, integration with third-party security tools, scalability, performance, resource requirements, adaptability to evolving cyber threats, and real- world case studies are also vital components of this research [29]. Ultimately, the goal is to equip organizations with the knowledge necessary to make well informed decisions regarding their choice of database model and to implement robust security measures for safeguarding their data [30].

3 Theoretical Study of Threats in Different Model Threats in Document Model

Threats in Document Models encompass various cyber- attacks that are distinct from those possible in relational databases [31]. One significant threat is Poisoning attacks, where malicious data is injected into the training dataset of the document model,

causing it to learn and subsequently generate incorrect or even harmful outputs. This threat is not feasible in relational databases as they do not store data in the same unstructured manner as document models. Evasion attacks are another concern, where attackers create inputs intended to deceive the document model into producing inaccurate results [32]. These are more challenging to execute against relational databases due to their structured nature and rigid data constraints. Inference attacks exploit the document model's ability to discern intricate relationships between data points to deduce sensitive information not explicitly stored within the model, an attack vector unavailable in relational databases. Beyond these specific threats document models, by their very nature, exhibit greater susceptibility to security breaches compared to relational databases [33]. Document models are generally more intricate and less thoroughly understood, making it more challenging to identify and mitigate security vulnerabilities within them. Threats in Relational Model-Threats to the relational model encompass a range of cyber-attacks, some of which are more commonly associated with relational databases and less likely to occur in document databases due to their structured nature. Prominent among these threats is SQL Injection (SQLi), wherein attackers exploit input validation vulnerabilities to inject malicious SQL code, potentially manipulating or extracting data [34].

NoSQL Injection is another concern, although document databases use different query languages. Privilege escalation is more common in relational databases due to their complex access control systems. Schema-based attacks may target the predefined database structure, leading to schema object alterations or deletions. Data manipulation attacks, open executed via SQL queries, are also prevalent. Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF) attacks can exploit web applications interacting with relational databases [35]. Brute force and dictionary attacks might target weak or default credentials [36]. Insider threats pose risks when authorized users misuse their privileges [37]. Database misconfigurations, such as open ports or weak authentication methods, can further expose relational databases to potential vulnerability [38, 39].

4 General Discussion

Comparing different database model, typically associated with NoSQL systems, and relational databases in the context of cybersecurity entails an evaluation across multiple dimensions [40]. Firstly, in terms of data structure, document databases like MongoDB and CouchDB adopt a semi- structured or unstructured document model (e.g., JSON or BSON), offering flexibility for managing intricate or evolving data structures, whereas relational databases, such as MySQL or PostgreSQL, adhere to structured tables with predefined schemas, affording greater control over data integrity [41]. Secondly, with respect to security features, document databases tend to provide rudimentary security mechanisms, encompassing authentication and authorization, often relying on external safeguards like firewalls and network security

tools, whereas relational databases possess well established security features, inclusive of user access controls, role-based permissions, and encryption options, typically offering more robust security measures [42]. The schema flexibility of document databases, while accommodating agility, can pose security risks if data validation and access control are not rigorously administered [43]. Conversely, the rigid schema enforced by relational databases enhances data integrity and mitigates certain threats, such as SQL injection, by enforcing predefined structures. Data validation is chiefly the responsibility of the application in document databases, potentially leading to data integrity lapses if inadequately managed [44]. In relational databases, data validation is an intrinsic element, minimizing the likelihood of storing malformed data [45]. Scaling considerations diverge as document database are commonly linked with horizontal scalability, introducing complexities in security when handling distributed data across multiple nodes, whereas relational databases typically favour vertical scalability, which can be more straight forward to manage but may curtail scaling options [46]. Query languages for document databases, although less expressive than SQL, limit query complexity, reducing the susceptibility to specific attacks, like complex joins. Relational databases employing SQL can be susceptible to SQL injection if not diligently sanitized [47]. Regarding backup and recovery procedures, document databases display variability across specific systems, potentially offering less mature practices compared to traditional relational databases, which are renowned for their established backup and recovery mechanisms, ensuring data resilience [48]. Audit and compliance features in document databases may be limited, necessitating supplementary tools or bespoke solutions to full fill regulatory requirements, while relational databases frequently present more robust audit and compliance capabilities, facilitating regulatory compliance [49]. In conclusion, both document-based and relational databases can be effectively secured, contingent on the particulars of the use case, data prerequisites, and the scope of implementable security measures. Irrespective of the database type, a robust security posture mandates diligent access control, encryption, and periodic security assessments [50].

5 Detailed Survey

1. Data Tampering: In today's digitally interconnected world, securing sensitive data stored in various database models has become a paramount concern. Data tampering attacks, where unauthorized entities manipulate or alter data, can compromise the integrity of information [51]. This essay explores and compares three situations in which data tampering attacks may occur across different database models: documentoriented databases, relational databases, and cloud databases [52].

1.1. Document-Oriented Database: One critical vulnerability in document-oriented databases, exemplified by MongoDB, lies in the lack of robust access controls. If proper authentication and authorization mechanisms are not implemented, attackers may exploit vulnerabilities to gain unauthorized access. Once inside,

these adversaries can tamper with document data, modifying or even deleting information at will. Furthermore, insecure API endpoints present another avenue for potential attacks [53]. If these communication channels lack encryption or robust authentication, attackers could manipulate data during transit, compromising the integrity of the stored information. The absence of encryption at rest exacerbates the risk, allowing attackers with physical or unauthorized access to directly tamper with stored data [54].

1.2. Relational Database: In relational databases like MySQL or PostgreSQL, the threat of SQL injection attacks looms large when applications fail to validate and sanitize user inputs adequately [55]. Successful SQL injection attacks enable unauthorized data modifications, including tampering with records and altering the database schema. Weak authentication mechanisms compound this risk, as attackers might exploit compromised credentials to gain unauthorized access. Once inside, these malicious actors can manipulate, modify, or delete critical information. Moreover, insufficient logging and monitoring practices make it challenging to detect unauthorized access promptly, allowing attackers to tamper with data unnoticed until later stages [51].

1.3 . Cloud Database: Cloud databases, reliant on Identity and Access Management (IAM) for access control, face distinct vulnerabilities. Misconfigured IAM policies, such as overly permissive settings expose cloud databases to unauthorized access [50]. Once access is compromised, attackers may tamper with data, alter configurations, or even delete records, posing a significant threat to data integrity. Misconfigured security groups or firewall rules in cloud environments further increase the risk of unauthorized access, providing attackers with opportunities to tamper with data or carry out other malicious activities [55]. Additionally, insufficient encryption during data transmission (in transit) and storage (at rest) can allow attackers to intercept communication or gain access to stored data, enabling data tampering. In conclusion, safeguarding against data tampering necessitates a multifaceted approach across different database models [3]. Secure coding practices, robust access controls, encryption protocols, and vigilant monitoring are imperative. Regular security audits and updates play a crucial role in mitigating the risks associated with data tampering attacks. As technology evolves, the need for comprehensive security measures becomes increasingly vital to ensure the integrity and trustworthiness of stored data across diverse database environments. attackers to intercept communication or gain access to stored data, enabling data tampering. In conclusion, safeguarding against data tampering necessitates a multifaceted approach across different database models [3]. Secure coding practices, robust access controls, encryption protocols, and vigilant monitoring are imperative. Regular security audits and updates play a crucial role in mitigating the risks associated with data tampering attacks. As technology evolves,

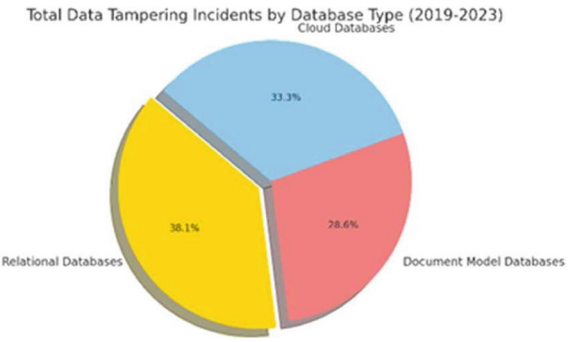


Fig. 1 Percentage sharing of data tampering among various database

the need for comprehensive security measures becomes increasingly vital to ensure the integrity and trustworthiness of stored data across diverse database environments (Fig. 1).

1. Man in the Middle Attack The evolution of database technologies has revolutionized data management, providing efficiency and flexibility but concurrently introducing new security challenges. Among these threats, Man-in-the Middle (MitM) attacks have emerged as a significant concern. This paper delves into the exploration and comparison of MitM attack scenarios within document model databases, relational databases, and cloud databases. The goal is to equip organizations with a nuanced understanding of these scenarios, enabling the implementation of effective mitigation strategies to safeguard their invaluable data assets.

2.1.1 Document Model Database: The document model database section scrutinizes the specific risks associated with MitM attacks. Communication between clients and the database involves the exchange of JSON or BSON documents, rendering it susceptible to interception and tampering. Emphasis is placed on the potential ramifications of unauthorized changes in the database or the leakage of sensitive information. This section underscores the paramount importance of securing document transmissions to ensure the integrity and confidentiality of data.

2.1.2 Relational Database: In the realm of relational databases, the focus shifts to the vulnerability of SQL queries to MitM attacks. As SQL queries serve as a fundamental means of communication, attackers can intercept and modify them. The section explores potential outcomes, including unauthorized changes to the database structure and the exposure of confidential information. Mitigation strategies center around bolstering query security to counter these threats and maintain the integrity of relational database systems.

2.1.3. Cloud Database: The cloud database section addresses the distinctive challenges posed by distributed systems and remote server storage. MitM attacks in this environment can manifest through the interception of cloud service communication and unauthorized access to cloud credentials. The paper

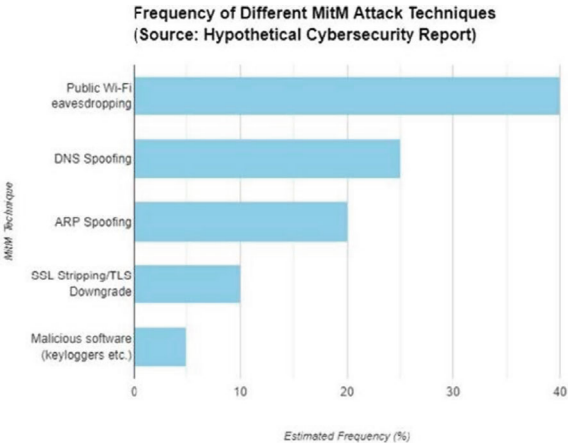


Fig. 2 Frequency of different MitM attack

delves into the implications of these attacks, stressing the critical need to secure communication channels and access credentials in cloud-based database services. By doing so, organizations can fortify their defence against sophisticated MitM threats in the cloud (Fig. 2; Table 1).

2.2 Mitigation Strategies: Irrespective of database type, the paper proposes a set of general mitigation strategies to effectively counter MitM attacks. Encryption emerges as a key strategy for protecting data in transit, while robust authentication mechanisms are advocated to verify the identities of both clients and servers. The adoption of secure communication protocols with regular updates serves to address vulnerabilities systematically. Additionally, comprehensive monitoring and auditing practices are essential for detecting and responding to unusual patterns or unauthorized access, forming a holistic defence against evolving MitM threats.

1. Brute Force Attacks Brute force attacks can target various types of systems, including document models, relational databases, and cloud databases. Below, we will compare three situations where a brute force attack might occur in each of these contexts:

Table 1 Percentage sharing of MitM cases across different database types

Year	Relational databases (%)	Document model databases (%)	Cloud databases (%)
2019	25	15	40
2020	30	18	42
2021	27	20	45
2022	29	19	48
2023	35	22	50

3.1 Brute Force Attack in Document Model: A document model database, such as MongoDB, is used to store unstructured data in JSON-like documents. An attacker attempts to gain unauthorized access to the document database by repeatedly trying different username and password combinations. The attacker may exploit weak or default credentials, attempting to guess the correct ones through brute force. Mitigation Measures: Implement strong password policies. Enforce account lockouts aver a certain number of failed login attempts. Regularly audit and update access controls and credentials.

3.2 Brute Force Attack in Relational Database: A relational database, like MySQL or PostgreSQL, is employed to store structured data in tables with predefined relationships. Data Retrieval: An attacker tries to extract sensitive information from the database by repeatedly attempting to guess SQL queries or exploiting vulnerabilities to extract data. Mitigation Measures: Apply parameterized queries to prevent SQL injection attacks. Regularly update and patch the database management system to fix any known vulnerabilities. Implement strong access controls to restrict unauthorized data accessed.

3.3 Brute Force Attack in Cloud Database: A cloud-based database, such as Amazon RDS or Azure SQL Database, is utilized to store and manage data in a scalable and flexible manner. Possible Brute Force Attack-Resource Hijacking: An attacker attempts to gain control of the cloud database by brute forcing access to the cloud provider's management console or API. The attacker may try to manipulate access controls, launch unauthorized instances, or modify configurations. Mitigation Measures: Use multi-factor authentication (MFA) for cloud provider accounts. Regularly monitor and audit cloud resources for any unusual activity. Employ identity and access management (IAM) policies to restrict access based on the principle of least privilege (Fig. 3).

2. Cross-Site Forgery (CSRF) attacks Cross-Site Forgery (CSRF) attacks can occur in various scenarios, regardless of whether the application is using a document model, a relational database, or a cloud database. However, the attack vectors

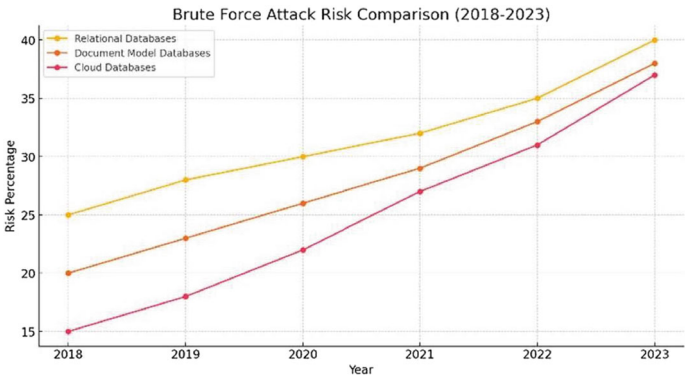


Fig. 3 Graphical data of Brute force incident hiking from 2018 to 2023

and potential risks may differ based on the underlying technology. Let's explore three situations in each context (Figs. 4 and 5).

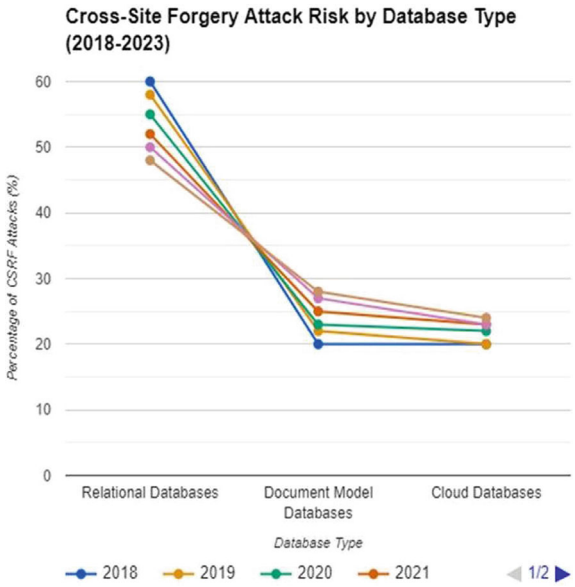


Fig. 4 CSF attack incidents from 2018 to 2023

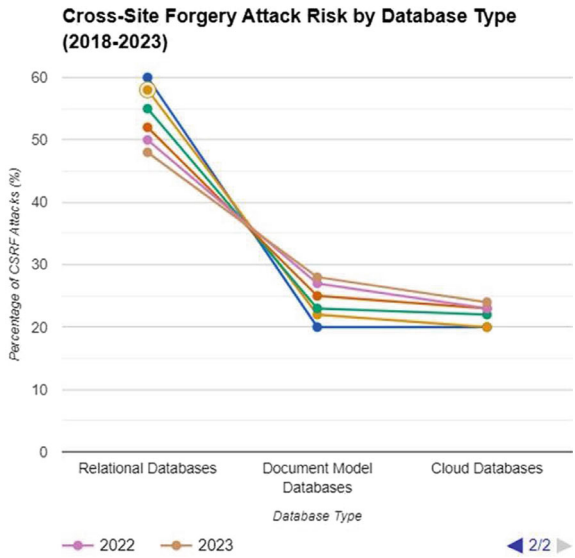


Fig. 5 CSF attack incidents of 2022 and 2023. *Source* https://github.com/HamzaLatif02/HRDataset_Visualisation

6 Prevention and Detection Strategies

Preventing and detecting various database attacks is a multifaceted endeavour critical for maintaining the confidentiality, integrity, and availability of data. Cross-Site Forgery (CSRF) prevention involves not only implementing CSRF tokens and secure coding practices but also ensuring robust validation of user input and employing mechanisms to authenticate and authorize users [11]. Detection requires continuous monitoring of web server logs for suspicious activity, analyzing HTTP requests for anomalies, and leveraging sophisticated intrusion detection systems (IDS) capable of identifying CSRF attempts amidst the vast amount of web traffic. Session hijacking prevention strategies extend beyond implementing HTTPS encryption and strong session management techniques to include regular session monitoring and the implementation of session expiration policies [27]. Detecting session hijacking attempts necessitates vigilant monitoring of session activity for irregularities, logging and analyzing session data for unusual patterns, and employing intrusion detection systems capable of identifying unauthorized access or session manipulation. To mitigate Distributed Denial of Service (DDoS) attacks, organizations must deploy a combination of DDoS mitigation solutions such as rate limiting, traffic filtering, and utilizing content delivery networks (CDNs) to distribute incoming traffic effectively. Detecting DDoS attacks involves monitoring network traffic for sudden spikes or patterns consistent with DDoS activity, analyzing server performance metrics to identify anomalies, and promptly responding with appropriate mitigation measures to mitigate the impact on service availability [33]. Brute force attack prevention encompasses enforcing stringent password policies, implementing account lockout mechanisms, and promoting the use of multi-factor authentication to bolster security. Detection requires monitoring login attempts for multiple failed logins within a short one frame, analyzing authentication logs for suspicious patterns indicative of brute force attempts, and employing intrusion detection systems capable of flagging and responding to unauthorized login attempts promptly [24]. Mitigating Man-in-the-Middle (MitM) attacks involves implementing HTTPS encryption with robust SSL/TLS configurations, verifying server certificates to prevent spoofing, and employing techniques like certificate pinning to enhance security [35]. Detection requires continuous monitoring of network traffic for signs of unauthorized interception or tampering, analyzing SSL/TLS handshake details for anomalies, and utilizing network intrusion detection systems (NIDS) to identify and respond to MitM attack attempts promptly [22]. Finally, preventing data tampering necessitates implementing comprehensive access controls and permissions, encrypting sensitive data at rest and in transit using strong cryptographic algorithms, and implementing integrity checks such as cryptographic hashing to detect unauthorized alterations to data [17]. Detection involves monitoring for unauthorized changes to data, implementing file integrity monitoring systems capable of detecting and alerting administrators to unauthorized modifications, and conducting regular audits to ensure data integrity and compliance with security policies [5]. By adopting a proactive approach

to prevention and detection, organizations can effectively mitigate the risk of database attacks and safeguard their critical assets against malicious actors [8].

7 Conclusion

In conclusion, this research paper has provided a comprehensive examination of security threats and mitigation strategies across diverse database environments, including document-oriented, relational, and cloud databases. Through detailed analysis and comparison, we have highlighted the vulnerabilities inherent in each database model and proposed effective measures to safeguard against data tampering, Man- in-the-Middle attacks, brute force attacks, cross-site forgery attacks, distributed denial of service attacks, and session hijacking. It is evident that the evolution of database technologies has introduced new security challenges, necessitating a multi-faceted approach to data protection. Secure coding practices, robust access controls, encryption protocols, and vigilant monitoring are imperative in mitigating the risks associated with modern- day cyber threats. Furthermore, regular security audits, updates, and proactive measures are essential to maintaining the integrity and trustworthiness of stored data across diverse database environments. As technology continues to advance, the need for comprehensive security measures becomes increasingly vital to safeguard sensitive information and uphold user trust. Organizations must remain vigilant and proactive in addressing emerging threats, adopting best practices, and staying informed about evolving security trends. By implementing the recommendations outlined in this paper, organizations can enhance their overall security posture and mitigate the risks posed by malicious actors in the everchanging landscape of database security.

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Adjustments in Interest Rates and Their Impact on Overall Economic Performance: A Technical and Legal Analysis



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Abstract The chapter tackles interest rate adjustments by commercial banks and their effects, both legal and financial, on individuals and firms. It tries to answer the scope of the bank's power regarding interest rate modifications and analyzes the implications emerging out of it by reviewing the set-up laws and regulations governing such actions. The specific objective is to determine how interest rate adjustments impact loans, deposits, and other related variables. This chapter finds that banks have a significant amount of discretionary powers in adjusting interest rates; hence, there has to be a proper legal mechanism in place protecting depositor's interests (customer's rights) and ensuring financial stability. It also shows that borrowing costs and savings rates are directly influenced by interest rate adjustments, which have implications for individual and corporate financial decisions. According to the findings, the study recommends a policy and procedural framework for transparency in interest rate adjustment processes and increased statutory regulation to strike an equilibrium between the interests of banks and those of customers.

Keywords Interest rate adjustment · Commercial banks · Legal impacts

1 Introduction

The scope of the bank's commitment to interest rate adjustment is a topic that creates much interest and discussion in the banking and economic systems. It refers to the power of central and commercial banks to change the interest rate on loans and deposits extended to their customers, be they companies or individuals. Such adjustments can have an impact large enough to affect the whole economy as

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well as people's and companies' lives. Hence, it is most necessary for a detailed understanding of what constitutes the scope of the bank in this respect [1].

Central banks are integral to any country's financial system by conducting the monetary policy and overseeing money supply. The major possible action central banks can undertake in attaining their monetary goals is varying interest rates. Interest rates refer to the rate at which banks lend to each other overnight when in need of meeting the reserve requirements. It also influences market interest rates for borrowers and savers.

So the central bank has the power to raise or lower this key rate, contingent upon economic goals and current economic conditions. Adapting the interest rate has inflation as one of its primary goals. Inflation is described as a general and sustained increase in the price level of goods and services in any economy over a specified period—typically represented by a percentage that is a change in the price index. Based on this, the research aimed at comprehension regarding what is considered to be far-reaching effects related to interest rate adjustments during the stage of entering into contracts.

1.1 Study Objectives

This study aims to achieve the following objectives:

1. To examine the scope of the powers of central and commercial banks to adjust interest rates and how this affects loans and deposits.
2. To identify the legal and financial implications that may result from adjustments to interest rates during the conclusion and duration of the contract and how they affect the parties involved.
3. To analyze the factors influencing the setting of the interest rate, including monetary policy, increased government spending and the money supply.
4. To examine the legal regulations governing interest rate adjustments and their effectiveness in achieving economic and financial stability.

1.2 Methodology

The analysis has used a descriptive approach to studying interest rate adjustments in commercial banks and both their legal and financial impacts. Its aim is to describe as perfectly and completely as possible the phenomena concerning data on interest rate adjustments and the effects that result from them.

2 Implications of Interest Rate Adjustments During the Contract Formation Stage

The interest rates are determined during the formation of the contract on a case by case basis of the various legal and financial factors that may or may not apply to different banks or contracts. It is important to confirm the terms and conditions agreed upon in the original contract, especially if there are future interest rate adjustment clauses. Several important points must be considered, with legal language being one of the most prominent. Contracts usually contain precise and specific legal language [2].

In a consumer loan agreement, the contract established between the bank and the borrower might outline particular timeframes, allowing the borrower a designated period to exit the agreement. Consequently, it is essential for the parties involved in the contract to take into account the specified timeframes, their lengths, and the related provisions [3].

This section will be split into two parts: the first will explore the elements that affect interest rates and the approaches to calculate them, while the second will focus on the legal frameworks governing how banks can adjust interest rates.

3 Factors Influencing Interest Rates and Methods of Determining Them

Monetary policy represents a key stability measure employed by nations to tackle the various economic imbalances that arise during economic development. It significantly affects both real and nominal economic activities, though this effect tends to vary and is contingent upon the monetary policy framework established by the central bank, along with the level of independence of the monetary authority [4]. Consequently, any country's chosen monetary policy influences its interest rates. The factors that affect interest rates can be categorized into several groups. In this subsection, the researcher will explore the elements that impact interest rates and clarify how interest rates are determined through negotiation, organizing the discussion into two primary sections as follows:

3.1 Reasons for Adjusting Interest Rates

Interest rates are connected to various economic concepts and are affected by multiple factors that influence their changes. Central banks utilize interest rate setting as a key instrument in their monetary policy, working in conjunction with other tools and factors that interact. Consequently, the researcher will outline the relationship between interest rates and other economic concepts before detailing the factors that impact adjustments in interest rates, as follows:

3.1.1 Increased Government Spending

Government intervention in the form of public spending is an essential financial instrument employed to address the needs of the populace and fulfill societal objectives. This approach reflects how both central and local governments assume public responsibilities, as well as the economic policies implemented by the state.

In terms of the connection between government spending and interest rates, it can be asserted that public expenditure by the government has an inverse relationship with prices. When prices rise, interest rates increase, which diminishes and curtails borrowing for both investment and consumption. On the other hand, when prices fall, interest rates decrease, promoting borrowing for consumption and investment.

3.1.2 Money Supply

The money supply, which includes currency in circulation and demand deposits, is influenced by the monetary policy implemented in a country. By exercising monetary authority to regulate the total amount of money within the economy, an increase in the money supply can result in decreased interest rates and a possible increase in inflation rates, and the opposite is also true.

The total means of payment that influence the overall demand for goods and services is referred to as the money supply. It is defined as the amount of currency in circulation within a society during a certain timeframe, or as the total money represented by all available payment methods. This money supply concept encompasses various components. When establishing interest rates, banks adhere to the directives of the central bank and are prohibited from offering loans at rates lower than those determined by the central bank. The interest rate established by the central bank is associated with the country's economic state. During periods of economic downturn, the central bank lowers interest rates, prompting banks to borrow more and enhancing the availability of funds for loans to both businesses and individuals. In contrast, when inflation occurs, the central bank increases interest rates, which diminishes banks' willingness to borrow, subsequently raising loan rates and reducing the demand for loans.

3.1.3 Monetary Policy

Monetary policy involves the management of the money supply available for circulation. It includes the different strategies and techniques employed by monetary authorities to oversee both money and credit, as well as to regulate the liquidity essential for the national economy.

Changes in monetary policy and the money supply influence interest rates. A shift in the money supply and available liquidity directly and indirectly affects the determination of interest rates. For instance, as interest rates on non-cash financial assets like bonds increase, the demand for these assets also rises. On the other hand,

when interest rates on such assets decline, the demand for cash grows, making these assets less appealing to hold. Consequently, higher interest rates lead to an increase in the velocity of money, while lower rates result in a decrease.

Monetary policy serves as a key stability measure implemented by nations to tackle the diverse economic imbalances that arise during economic growth, reflecting the monetary dimension of overall economic policy. Central banks oversee monetary policy by modifying the money supply, typically through the buying or selling of securities in the open market. These open market operations impact short-term interest rates, subsequently affecting longer-term rates and overall economic activity. When central banks reduce interest rates, the monetary policy shifts towards an accommodative stance. In contrast, raising interest rates results in a more restrictive monetary policy.

The researcher believes that the Central Bank of Jordan should reevaluate its monetary policy to guarantee that interest rates are established in a manner that maintains sufficient market liquidity and stops banks from excessively increasing interest rates.

3.2 Negotiating Interest Rate Adjustments

Certain contracts might outline specific terms for negotiating changes to the interest rate, and adherence to these terms is required by the relevant laws and regulations. The process of adjusting interest rates can sometimes be legally intricate, given that financial and banking regulations differ across countries. Consequently, it is vital to take into account the local laws and regulatory requirements that govern interest rate adjustments, as these legal frameworks are crucial elements to consider during the negotiation of interest rate modifications in a contract [5].

In every nation, regulatory authorities establish laws and regulations governing the banking and financial services sector. Both banks and their clients are obligated to follow the local laws that pertain to adjustments in interest rates. These local regulations may encompass particular legal stipulations concerning the modification of interest rates within financial agreements. Compliance with these stipulations is essential for both the bank and the client. Should a disagreement arise between the bank and the client over an interest rate adjustment, and a mutually acceptable resolution is not achieved, local laws may necessitate legal actions to address the dispute [5].

Various forms exist for bank loan contracts, each differing in their legal characteristics. Although the majority of these contracts usually display traits of adhesion contracts, which frequently allow minimal negotiation space between the involved parties, other contract types, like syndicated loan agreements, do permit some negotiation regarding terms. This highlights the importance of addressing potential negotiation terms that may arise between the parties involved and examining the necessity for legislative action in this domain [5].

The process of negotiation plays a vital role in modifying interest rates within financial agreements. Clients have the opportunity to engage with the bank to discuss contract conditions, including the interest rate, especially when faced with economic shifts or financial situations that warrant these changes. This negotiation could provide an opportunity for clients to secure a more advantageous agreement.

As a result, it may be necessary to provide prior notice in accordance with financial and banking regulations as well as contractual agreements to promote transparency and allow the client to comprehend and negotiate any suggested changes to the interest rate if needed. In certain instances, laws or the initial terms of the contract may mandate that the bank give advance notice, such as 30 days, before making any adjustments to the interest rates.

Negotiations and bilateral agreements between the client and the bank are crucial in determining interest rate adjustments, allowing both parties to discuss the specifics and terms surrounding these changes. It is essential that these negotiations adhere to principles of fairness and transparency while also complying with relevant laws and regulations. After reaching an agreement, the details should be documented in a written contract that safeguards the rights of both the bank and the client, clearly outlining their respective obligations. These contracts not only address the needs of each party but also promote orderly and lawful management of modifications, highlighting the necessity of effective communication and mutual understanding between the bank and the client.

Furthermore, the agreement must outline the repayment deadline for both the borrowed sum and interest, obligating the borrower to return the total amount along with interest to the lending institution. Alternatively, the borrower may opt for an installment plan, breaking the total into several payments distributed over designated time frames.

The principle of good faith in contracts must also be upheld. To guarantee the validity of a contract, the Jordanian legislator highlights the importance of good faith for all parties engaged in the agreement. Article 202 of the Civil Code states:

1. "Contracts must be executed in accordance with their terms and in a manner that aligns with the principle of good faith."
2. "The contract is not limited to the obligations stated within it but also includes what is required by law, custom, and the nature of the transaction."

In Jordanian legislation, the principle of good faith plays a vital role during negotiations. This principle takes into account the intentions and desires of the parties involved in the legal agreement. Originating from a legal doctrine, it requires the judge to evaluate the behavior of each party to ascertain whether their actions align with standard norms.

It is essential to highlight that, akin to other Arab legal frameworks, the Jordanian legislator has not provided explicit regulations for contractual negotiations; however, there is an implicit acknowledgment of the importance of applying the principle of good faith during the negotiation stage, as this principle is widely recognized throughout Jordanian Civil Law. Additionally, a critical matter deserves attention:

the inconsistent approach of the Jordanian Court of Cassation regarding the classification of bank loan contracts as adhesion contracts. In certain decisions, the Court has determined that bank loan contracts do not fall under the category of adhesion contracts. For instance, one ruling stated: "… A loan contract is considered a consensual contract, not an adhesion contract, and therefore the appellant is not required to notify the respondent before filing the lawsuit."

The researcher notes that the Court of Cassation has merged consensual contracts with adhesion contracts. Just because a loan contract is categorized as consensual does not automatically eliminate its nature as an adhesion contract. Furthermore, the Court has previously looked into the presence of abusive conditions within bank loan contracts, suggesting the potential for classifying these contracts as adhesion agreements. Nonetheless, certain bank loan types, like syndicated loans, demonstrate clear stages of negotiation.

Legislative intervention is essential to establish clear legal provisions governing the negotiation stage of bank loan contracts in order to address conflicts regarding the potential adjustment of interest rates. This would explicitly empower borrowers with the right to negotiate the terms of their contracts, including modifications to interest rates, thereby promoting legal fairness and improving borrower protection.

4 Legal Framework for Interest Rate Adjustments by Banks

Modifying the interest rate requires a high degree of accuracy and carries substantial significance. As noted earlier, this matter is neither trivial nor arbitrary because of the possible benefits and drawbacks it may involve [1]. The adjustment of interest rates by the bank is regulated by a legal framework that must be followed. For the attainment of economic and financial stability within the nation, altering interest rates is essential, which necessitates that central banks conduct a comprehensive analysis of prevailing conditions and their effects on these adjustments.

The adjustments of interest rates throughout the duration of the contract come with both advantages and disadvantages. Consequently, this section will be split into two segments: the first will explore the benefits and drawbacks of modifying interest rates, while the second will focus on the extent of the bank's power in implementing these changes [2].

4.1 Positives and Negatives of Interest Rate Adjustments

Drawing from the earlier information, multiple factors influence interest rates, which are connected to several economic concepts that serve as instruments for central bank monetary policy. To prevent redundancy, this section will succinctly examine

the advantages and disadvantages of modifying interest rates, as well as the elements that impact these adjustments [3].

Modifying interest rates brings numerous advantages for both the bank and its clients. When market interest rates rise, clients have the opportunity to alter their contracts, easing the financial strain created by increased interest charges on their loans. This modification proves beneficial for both individuals and businesses that depend significantly on borrowing to fund their projects and operations. For banks, the ability to adjust rates is crucial in managing the financial risks and costs associated with fluctuating interest rates, enabling them to mitigate risks and uphold operational viability. Additionally, fostering flexible and reciprocal adjustments in interest rates between clients and banks can contribute to a constructive relationship, steering clear of legal disputes or actions stemming from payment challenges triggered by interest rate shifts [6–10]. Reaching agreements on adjustments that accommodate the needs of both parties can strengthen long-term relationships and bolster the client's confidence in the bank's capacity to provide support and navigate financial changes effectively. This approach also serves as a strategy to respond to economic fluctuations, including inflation and recession. When central banks opt to raise interest rates in order to combat inflation, commercial banks have the option to implement these changes on existing contracts rather than creating new ones with elevated rates. This strategy enables banks to play a role in wider monetary and economic policies while avoiding significant alterations to current agreements. Such adaptability can aid in preserving economic stability and mitigating the adverse effects of economic volatility [11–14].

Conversely, regular modifications to interest rates can lead to uncertainty and instability for clients, complicating their ability to prepare for the future and make significant investment choices. Long-term loans, including mortgages, can also be affected by these frequent interest rate fluctuations, influencing anticipated interest expenses over many years. As a result, it is essential for banks and regulatory agencies to take this aspect into account when deciding on interest rate adjustments and to offer clients transparency and guidance to aid their understanding of how these changes may affect their financial situation [15].

Another possible drawback of frequent adjustments to interest rates is the rise in financial costs. When interest expenses increase abruptly and consistently, clients face added financial pressures that can impact their budgeting and future borrowing and repayment capabilities [5].

To alleviate this impact, it is advisable for banks to implement guiding policies that balance the interests of both the client and the institution. Clients may explore options like fixing or hedging interest rates to ensure stability in the event of significant increases. For example, the Jordanian Court of Cassation ruled that "Article six of the loan contract stipulated fixing the interest rate for the first year only, with a review of the interest rate at the end of each three-month period following the end of the first year, allowing the plaintiff to adjust the interest rate according to the rates announced by the bank" [16].

Challenges in financial planning emerge for both individuals and businesses when there is ambiguity regarding the effects of upcoming interest rate changes. Entering

into banking contracts necessitates thorough analytical evaluation beforehand. To protect their profits, banks must foresee potential risks that could influence interest rates.

When inflation stays within manageable and sustainable boundaries, it can be beneficial, promoting both investment and consumer spending. On the other hand, when inflation becomes excessive or out of control, it can trigger serious economic issues, resulting in several adverse consequences. One significant effect of inflation is the decline in currency value, which reduces the amount of goods and services that can be purchased compared to earlier times. This decline can adversely impact individuals' purchasing power and overall savings, meaning that the same amount of money will afford fewer goods and services than it did previously [17].

The purchasing power of currency can be diminished by inflation, which adversely affects individuals and their savings by allowing currency to acquire fewer goods and services than previously possible. This leads to a rise in the cost of living and a reduction in the real value of savings. People on fixed incomes may also suffer due to inflation, as they face rising prices for goods and services without any increase in their earnings. Furthermore, inflation can influence financial markets by heightening price volatility and affecting the returns on investments [18].

In various nations, central banks work diligently to uphold a suitable inflation level through monetary policy measures, such as modifying interest rates. As previously noted, the objective of central banks is to harmonize inflation, financial stability, and economic growth to ensure the vitality of the national economy. Economic growth, defined as the rise in a country or region's economic value over a designated timeframe, is typically expressed as a percentage increase in Gross Domestic Product (GDP), which represents the total monetary worth of all goods and services produced within a country or region during that period. This growth serves as a crucial indicator of both economic health and the well-being of the community.

Enhancing economic growth involves investing in infrastructure, education, research and development, and technology. This investment encompasses company efforts to expand their operations, grow the workforce, and enhance labor skills, all aimed at raising productivity and fostering growth. Innovations and technological advancements play a crucial role in boosting productivity and driving economic expansion. Furthermore, international trade enables nations to leverage their specialization advantages, leading to increased production and growth through trade exchanges. Economic policies that encourage investment and support diverse economic sectors are essential for facilitating economic growth [19].

Attracting investment plays a crucial role in the economic development strategies of regions and countries, leading to enhanced productivity, job creation, and better living standards. The presence of advanced infrastructure supports production, transportation, and distribution, thereby increasing the area's investment appeal. A substantial market for goods and services further entices investment, enabling companies to realize higher sales and profits. Additionally, a skilled and qualified workforce can enhance a region's attractiveness for investment, as businesses benefit from trained employees who elevate productivity. Moreover, political stability and a favorable regulatory environment render a region suitable for investment, allowing

companies to confidently strategize for the future. Certain industries may find regions appealing due to relative advantages like low production costs or easy access to raw materials.

Strategies for attracting investment emphasize the improvement of these positive elements by providing incentives like tax exemptions, guarantees for investments, and streamlining administrative processes. In addition, fostering strong relationships with international firms and investors is essential for drawing in investment, along with ensuring a stable and sustainable business climate.

From the preceding information, it can be inferred that interest rates have a social effect, particularly on low-income borrowers, adversely influencing their livelihoods. Additionally, we note the implications of interest rates on the banking sector overall, where rising rates can present considerable risks, chiefly the potential for borrowers to default on repayments [20].

An increase in interest rates also has a social downside, which becomes evident when interest rates rise. Borrowers are typically negatively affected in the following ways:

1. As interest rates increase, the expenses associated with borrowing for both individuals and businesses also go up. Consequently, borrowers will face larger interest payments on loans, mortgages, and personal credit. In simple terms, higher interest rates result in greater amounts of money paid as part of the borrowing costs [21].
2. As borrowing costs rise, borrowers might find themselves with reduced funds to allocate towards other goods and services. This situation can adversely affect both consumer spending and overall investment within the economy. When people and businesses face higher interest payments on loans and credit, their capacity to spend on additional goods and services diminishes, potentially leading to a decline in lending and investment throughout the economy [22].
3. Individuals and businesses with current loans that have variable interest rates might face higher monthly payments as interest rates increase. This situation can create a financial strain for them [23].
4. Increased interest rates can lead to more costly mortgages, impacting the real estate market and making it harder for certain individuals to buy homes or obtain mortgage loans [24].
5. Increasing interest rates may impact the economy as a whole by curbing both spending and investment, potentially leading to a slowdown in economic growth [25].

5 The Scope of the Bank's Authority to Adjust Interest Rates

The ability of the bank to modify interest rates plays a vital role in securing both economic and financial stability within the nation. Decisions made by the central bank in this context must stem from a comprehensive evaluation of prevailing economic

and financial circumstances, alongside the primary goals of monetary policy [26]. Grasping the extent of the bank's power to alter interest rates is essential for understanding the broader impact of monetary policy on the economy, as well as its specific effects on individuals and businesses. The following characteristics define the bank's authority in adjusting interest rates.

5.1 General Monetary Policy

The authority to establish the primary interest rate, also known as the base interest rate, is held by the central bank [27]. This rate not only impacts the borrowing costs between banks but also affects the interest rates that banks present to both borrowers and savers in the marketplace. Adjusting this rate is part of the central bank's broader monetary and economic policy framework, which seeks to fulfill objectives like controlling inflation and fostering economic growth [28].

5.2 Changes in the Main Interest Rate

When faced with the potential of soaring inflation rates, the central bank can pursue multiple economic objectives by addressing inflation. To curb lending and subsequently slow down economic growth, the central bank might raise interest rates, which helps in managing inflation [7–10]. On the other hand, if there is a downturn in economic growth accompanied by rising unemployment, the central bank may opt to lower interest rates to encourage investment and boost spending, thus fostering growth. Furthermore, the central bank has the ability to manipulate interest rates to intervene in financial markets and maintain stability. Additionally, by adjusting the cost of government borrowing, the central bank can assist in reinforcing the government's overall monetary policy [11–14].

The central bank wields significant authority, which carries with it a substantial responsibility to meticulously assess data and economic circumstances in order to determine monetary rates aligned with both monetary policy objectives and prevailing conditions. This authority extends to the regulation and supervision of commercial banks and other financial institutions, encompassing oversight of their banking operations, as well as the imposition of capital and liquidity requirements along with other banking standards [6, 29, 30]. The primary aim is to maintain the stability of the banking system while safeguarding the interests of investors and customers. Additionally, the central bank possesses the ability to utilize its regulatory powers to intervene in financial situations when deemed necessary, overseeing banking activities. This facet of its authority entails establishing laws and regulations that dictate the conduct of banking operations, including capital requirements, banking standards, and financial and accounting practices [31].

The ability of the bank to modify interest rates is typically governed by both local and international policies and regulations that oversee banking operations and the sector as a whole. Generally, the bank's decisions regarding interest rate adjustments cannot be directly swayed by external entities, including nations or other organizations [32]. However, there are some factors that can indirectly affect banks' interest rate policies, such as [32, 33]:

- **Government Monetary Policy**: As noted earlier, one of the tools employed by the government in economic policy is aimed at steering and regulating economic activities toward designated objectives. Typically executed by the central bank or a comparable monetary authority, monetary policy encompasses various components and instruments to meet targets such as inflation control, economic expansion, and monetary stability [34]. Among these instruments, interest rates stand out as particularly significant. By adjusting interest rates, the government can impact borrowing and investment behaviors within the economy. An increase in interest rates raises borrowing costs, which in turn diminishes spending and investment, whereas a decrease in interest rates lowers borrowing costs and stimulates both spending and investment [35]. Consequently, the primary aim of government monetary policy is to fulfill specific economic goals through the management of the money supply, the modulation of interest rates, and the regulation of the banking sector. This policy is vital for influencing the country's economic landscape [36].
- **Inflation and Global Interest Rates**: Local interest rate policies can be influenced by global interest rates and inflation. A substantial rise in inflation or a decrease in global interest rates may affect the decisions made by the central bank [37–39].

From the aforementioned information, the central bank has the ability to increase interest rates, thereby making borrowing costlier. This action promotes saving while simultaneously curbing both borrowing and spending. As a result, demand and inflation are diminished. To manage the economy and address inflation, the central bank might implement higher interest rates by:

- **Increasing the Cost of Borrowing**: An increase in interest rates by the central bank makes borrowing from banks costlier. As a result, both individuals and businesses are likely to either reduce their borrowing or reconsider their decisions before taking loans for consumption or investment [38, 40].
- **Encouraging Savings**: As a result of higher borrowing costs, both individuals and businesses might opt to save more rather than take out loans. This shift leads to a decrease in the money flow within the economy, ultimately lowering the demand for goods and services [41, 42].
- **Reducing Demand and Inflation**: When there is a shift in spending contracts and an increased focus on saving instead of consumption, the demand for goods and services could decline. This shift can assist in alleviating price pressures and managing inflation [43].

6 Conclusion

In summary, interest rate adjustments play a key role in the economy and significantly affect individuals and businesses. By examining the scope of banks' authority to adjust interest rates and the related legal and financial implications, we have obtained valuable insights into how to improve the regulatory framework and ensure transparency in financial transactions. We hope that the recommendations presented will contribute to enhancing market stability and protecting the rights of the parties involved.

6.1 Results

The study reached the following conclusions:

1. The authority to adjust interest rates varies across central banks and commercial banks, and such adjustments significantly affect the entire economy as well as individuals and businesses.
2. Adjusting interest rates has important legal and financial implications, affecting the terms of contracts and leading to changes in the financial obligations of the parties involved
3. The study found that government spending, money supply and monetary policy play a key role in determining interest rates, and these factors can lead to changes in interest rates.
4. The study found that current legal controls provide an adequate framework for interest rate adjustments, but require improvements to ensure more effective financial stability.

6.2 Recommendations

1. Develop a regulatory framework for interest rate adjustments that ensures economic stability and balances the interests of all parties.
2. Increase transparency in negotiations between banks and customers on interest rate adjustments, including providing advance notice and ensuring that the terms are clear and understandable.
3. Regularly review monetary policy to ensure that it is consistent with current economic conditions and achieves financial stability objectives.

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The Impact of Multilingual Conversational AI Tools on Shaping User's Choices and Preferences



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Abstract The swift growth of multilingual conversational AI tools has revolutionized user engagement across a variety of sectors, including finance, education, healthcare, e-commerce, and beyond. Although prior research has investigated user preferences concerning gender and racial indicators in AI systems, there remains a gap in understanding how multilingual features impact user trust and choices regarding these technologies. This study aims to explore the effects of multilingual support in conversational AI on user interactions, preferences, and decisions, emphasizing natural language communication. Utilizing a qualitative research methodology, this chapter integrates literature from diverse disciplines such as artificial intelligence, linguistics, and human–computer interaction, applying both descriptive and analytical methods. The results underscore important implications for creating more inclusive and tailored AI systems that address varied linguistic and cultural requirements. Furthermore, the research illustrates how user selections related to language, accent, and interaction style are influenced by multilingual AI tools, providing valuable insights for businesses and governmental entities engaged in the development of multilingual digital platforms.

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1 Introduction

Across the globe, industries and businesses unite to explore, advance, and apply state-of-the-art AI technologies and innovations. One notable advancement is conversational AIs, which engage users through natural language interactions. These systems have reached new heights with enhanced multilingual capabilities and broader language marker data. Over time, their application has proliferated in various sectors, nearly all of which cater to consumer needs, including finance, education, medical diagnosis and healthcare, e-commerce, insurance, and real estate, among others [1].

Extensive research spanning various fields has been conducted on user behaviors and choices related to automated conversational systems. While some users show a preference for hybrid systems that merge the strengths of both human and AI capabilities, others exhibit greater trust in AI when it employs natural language understanding and communication [2]. The research community has established that users often hold biases and preferences linked to common gender and racial characteristics of AI systems. However, an ongoing question remains regarding the impact, if any, of multilingual support on user choices and preferences concerning conversational AI. Typically, AI systems that operate in non-native languages are perceived as more robotic, making them less appealing to users. Nevertheless, multilingual capabilities are becoming increasingly prevalent among leading AI technologies from companies such as Google, Amazon, and Microsoft [2]. English serves as the foundational market language spoken by a diverse array of races and ethnicities across various countries and continents, with a predominantly female voice profile being utilized in English AI systems. Still, the requirement for a secondary language tends to diminish the trustworthiness and desirability of AI systems in the eyes of users.

1.1 Research Significance

The importance of this research stems from its investigation into the ways multilingual conversational AI tools influence user preferences and choices, a vital topic in our current globalized and digitally oriented economy. As AI-driven systems become more embedded in consumer-focused sectors such as finance, education, healthcare, and e-commerce, it is crucial to comprehend how linguistic diversity affects user interactions. Although conversational AIs are widely utilized, the influence of multilingual features on user trust, satisfaction, and decision-making has yet to be thoroughly explored. This study aims to fill that void by examining how the provision of various languages shapes user preferences, particularly in a context where English

continues to dominate AI interfaces. Additionally, as companies strive to develop more inclusive and flexible AI solutions, the insights gained from this research will shed light on how language markers—like gender and cultural biases—interact with multilingual capabilities. The results will assist AI developers, marketers, and industries in crafting more customized and user-focused AI systems, ultimately promoting increased trust and adoption among diverse linguistic and cultural audiences.

1.2 Methodology

The chapter takes a qualitative approach in understanding the effects of multilingual AI conversational tools on preferences and choices of users. Under expository description, it is expected to carry out a systematic review and synthesis of relevant literature from disciplines related to artificial intelligence, linguistics, human–computer interaction and psychology. The worth of such technology has to be understood from the views or reports made or contributed by significant researchers or research bodies on multilingual conversational AI and systems influencing user behavior. These reports will have included in them, embedded or exposed to the reader in detail many different ways in which such technologies shape user trust, decision-making and preferences. Descriptive reviews are followed by an analytical technique, useful to reveal patterns and dependencies between multilingual features of AI tools and user interactions. This research approach combines descriptively and analytically a cross-disciplinary account of how far multilingual AI tools influence user choices and thereby offers directions for more customized and inclusive AI design.

2 Theoretical Framework

The surge in globalization and digitalization in the recent past decades has prominently contributed to the rise of multilingualism. It refers to the capacity and ability to use multiple languages, which is more proper [3]. The phenomenon can manifest globally in different forms—personal bilingualism, community multilingualism, and societal multilingualism. It has emerged to become a very important social asset for an individual in his or her academic, personal, social, and professional life [4]. Additionally, the diversity of multilingualism has stimulated theories, research, and policies across numerous academic fields such as linguistics, education, psychology, sociology, and political science, as well as influencing agendas and regulations at local, national, and international levels [5].

2.1 Multilingualism and User Interaction

We inhabit a world where cultural and geographical divides are gradually fading. Individuals are increasingly motivated to engage with one another, irrespective of their differing ethnic backgrounds, religions, cultures, or geographic origins [3]. The rise of conversational AI industries has led to the establishment of companies and the pursuit of services that bridge various communities. Nevertheless, it is essential to take into account the issue of multilingualism [6]. The natural languages prevalent across different regions possess significant variations, each characterized by its unique grammar, lexicon, and morphology [4].

Initially, conversational assistance concentrated primarily on individual languages, predominantly English. However, the rise of social media fostered a global convergence that encouraged multilingual interactions among users [7]. Grasping user engagement in a multilingual setting is crucial for the successful deployment of conversational systems. It is essential to capture user intent within a multilingual framework to enhance the overall user experience. Users often shift languages during conversations, presenting a challenge for systems designed to support only one language at a time [8]. Effectively managing multilingual interaction is a complex task, necessitating a system that is both robust and adaptable, addressing the various dimensions of multilingualism. These dimensions can be categorized into three main areas: Language Mix, which involves switching between languages; Mixed Interaction, where identical utterances are interpreted through the lens of different languages; and Language Enumeration, which pertains to the neglect of the number of languages utilized in the conversation [5]. Allowing individuals to communicate in their preferred languages boosts their self-esteem and fosters creativity. Using native languages also facilitates the expression of intricate ideas that are deeply connected to people's cultural backgrounds and perspectives. Thus, it is vital to take multilingualism into account when engaging with users [9].

2.2 Conversational AI Technologies

Since the emergence of the internet, content has been expanding across various fields. Every conceivable interest area now boasts its own group of enthusiasts, scholars, or practitioners who generate and share content on a daily basis [10]. Indeed, the knowledge cultivated within these communities often makes its way into publicly editable online encyclopedias like Wikipedia [11]. From a technological standpoint, the information within these resources follows a specific structure composed of text, images, and markup code [12]. Because of these uniform formats, the content is therefore amenable to machine processing [6].

User decisions during information seeking frequently center around desired content, specifically information pertaining to particular areas of interest [13]. Yet, even when the most pertinent information is available, there are various methods to

present it to users, such as the representation style (e.g., narrative vs. logical) or the emphasis on specific elements (e.g., opinionated vs. authoritative) [7]. This brings us to the issue of discourse selection, or phrasing, which concerns how information should be communicated to users [14]. Additionally, innovative technologies like Cognitive Agent Communications Language (CACL) can be utilized to develop multilingual conversational agents in a uniform way across various recognizable agent communication languages (ACLs) [7]. These advancements have the potential to enhance communication among agents in different knowledge formats tailored to language speaker models. In specific discourse contexts, agents could influence content preferences and establish models for dynamic heterogeneous multi-agent systems capable of generating their own content through a shared language [15]. Furthermore, conversational agents can facilitate the dissemination of scientific information by employing simpler writing production rules, such as text pattern utilization with LDA processes, thereby aiding the spread of knowledge in societies through less complex text-diffusing agent systems [8].

A significant drawback of the CACL language is the consistency in its application stemming from multilingual technologies [16]. Within the CACL ACL layer, innovative agents can utilize diverse datasets across various fitness formats and languages, thanks to the shared knowledge representation of content and format in any open knowledge format, including ontologies, SQL databases, and RDF graphs [8]. To prevent concept drift and reduce the diversity of knowledge representation, these content units must be employed according to specific fitness requirements of language users [17]. Content formats commonly created by agents, such as Basic Information Format (BIF) and summarization formats (FIR and MIF), can be integrated into an information exchange framework [8].

3 The Influence of Multilingual Conversational AI on User Choices

The rise of multilingual conversational AI systems is evident as more organizations implement them to tap into an expanding global market and connect with a broader audience. These AI systems present distinct benefits compared to monolingual versions, particularly their capacity to function in various languages [9]. By adopting multilingual conversational AI systems, organizations enhance their ability to fulfill user needs and expectations as individuals explore their options and preferences for these technologies [18]. Various facets of user preferences and choices pertain to multilingual conversational AI systems. The initial facet focuses on user preferences and choices related to the personalization and customization of these systems. The subsequent facet involves user choices and preferences concerning the cultural adaptation of multilingual conversational AI systems [9].

Conversational agents have the potential to seamlessly integrate into individuals' daily lives. With enhancements in conversational abilities and multimodal skills, as

demonstrated by the rise of voice assistants, these agents can significantly increase their effectiveness. The progress in personalization and customization paves the way for systems to transform growing volumes of information into valuable insights [19]. Grasping how conversational AI systems are utilized is crucial for the responsible, sustainable, and inclusive advancement of new technologies. Additionally, conversational AI systems face both challenges and opportunities due to the presence of highly diverse user groups. A recent study explores the ways in which factors such as age, gender, education, language proficiency, and socio-economic status affect fundamental user preferences and choices regarding conversational AI systems [10]. Important preferences, including language selection, desired gender, accent, age, voice tone, and preferred medium of conversation, are assessed, alongside the potential for personalization or customization [20].

An analysis of a choice experiment is utilized to investigate diverse user groups concerning their choices and preferences. This examination centers on conversational AI systems within Dutch public services [11]. These systems engage users through natural conversations using speech, text, or visual communication methods. They are crafted to comprehend user input and respond appropriately. Unlike monolingual systems, multilingual conversational AI systems can function in multiple languages, allowing them to better cater to the needs and expectations of users interacting in a language different from that of the organization [21]. A study assesses the impact of multilingual conversational AI systems on user choices and preferences.

3.1 Personalization and Customization

The recent rise of conversational AI can be linked to various factors, including technological progress, societal demands, and social contexts. Technology has now permeated nearly every facet of society, influencing work, education, healthcare, and social interactions [22]. However, many individuals still face challenges in accessing or comprehending the technologies that dominate contemporary life [11, 12]. Conversational AI offers a distinctive interface that enables broad access to technology for those with limited computer skills; for many, navigating the internet is as effortless as having a conversation with friends [13]. Additionally, conversational AI has the potential to foster global language connections, serving as a common language for individuals who speak different primary languages [14, 15]. The development of multilingual conversational AI empowers a wide array of people to engage with technology in their native tongue. This work primarily investigates how this phenomenon might influence various aspects of people's decisions and to what degree [23].

The personalization, customization, and functions of conversational AI are reshaped to seamlessly integrate into the user's lifestyle, fostering a unique experience [16]. Each user's dialect, tone of speech, and slang can be utilized by conversational AI [12, 17]. As a result, the interaction for a user engaging with conversational AI in Marathi featuring an Indian dialect is distinct from that of someone using it in Latin Spanish influenced by a South American dialect [18]. The variations in

language models become increasingly evident due to cultural differences regarding acceptable expressions [19]. Achieving full personalization is essential for conversational AI, enabling individuals or organizations to possess their very own distinct conversational AI [20]. Consequently, the choice of words, responses, and even the overall tone can be tailored [21]. Users might opt for a celebrity or a close friend to serve as their personalized conversational AI [22]. In this manner, conversational AI can evolve into a close companion or personal assistant, necessitating a strong bond of trust between the user and the AI [13, 23]. Effective incentives for conversational AI should take into account the management and application of personalization [24]. Within this framework, the optional characteristics assigned to a conversational AI need to be thoroughly defined and examined, given the significant risk of misuse [25]. Conversely, there exists the possibility of anonymized groups. By utilizing a common language model or several shared models, a degree of uniformity is maintained as universally recognized words, phrases, tones, and viewpoints come to the forefront [26]. While privacy is preserved without any connection to individual identities, unique cultural characteristics within specific regions or even nations continue to exist [14, 27].

3.2 Cultural Adaptation

The extensive evolution and progress of cutting-edge information and communication technologies is closely tied to globalization, particularly visible in the field of natural language technologies [28]. Emerging as an innovative solution, the impressive LinguaRobo platform leverages a culturally adaptable approach to facilitate the creation of highly advanced and dynamically flexible multilingual conversational AI in nearly any language, while also customizing it to align with the unique characteristics and complexities of local cultures [15, 29]. This state-of-the-art platform transforms the conversational AI landscape, positioning it at the forefront of competition within local markets, achieving unmatched user engagement, relevance, and interaction duration [30]. The remarkable implications of this extraordinary technology go beyond simple convenience, as it opens up a new world of user preferences and choices, significantly expanding the reach and scope of conversational AI in local markets [31]. The ability to engage in multiple languages serves as the key to unlocking the immense potential of conversational AI, paving the way for greater outreach and strengthening its presence within local markets worldwide [32]. At present, active members in the dynamic network come from 200 plus countries and territories connecting through various technology platforms. People get to use close to 7,000 different languages to communicate while creating connections that surpass the limits set on spoken language [33]. The real power of conversational AI comes within this complex mosaic of cultural diversity and linguistic richness. Since it is multilingual, it can converse with these varied user groups effortlessly in their native languages. Indeed, one can infer that in the near future, smart speakers and voice user interfaces get installed in homes to provide a seamless connection

between the conversational AI system and users undergoing social exclusion or isolation feeling inaccessibility in remote parts of their countries [34]. It bears optimal potential for enhancing user engagement with longer interactions for cultural adaptation, bespoke to multilingual conversational AI within unique cultural and traditional markets. At the center of this visionary concept is the platform LinguaRobo itself, identified as one of the strongest motors enabling easy, wide and cost-efficient realization of Conversational AI across many languages and cultures, united- within one totally unified framework [35]. Indeed, this cutting-edge development considers the unexplored domains of cultural adaptations in relation to different perceptual, emotional, attentional and intentional agents—each properly situated within its own context, and enriched with cultural subtleties that finally determine interpretations, choices, responses, and preferences for users from the Vision paper. As such, the very essence of LinguaRobo's transformative potential is inextricably bound up with cultural adaptation- it lifts Conversational AI onto enormously elevated planes of user-centricity and personalization that transcend entirely the limits of language and culture towards unprecedented levels of global understanding and connectivity [36].

4 The Role of User Preferences in Multilingual Conversational AI Design

User preferences play a huge role in the development of multilingual conversational AI systems. In light of this, the following are the key elements to be considered regarding these preferences during the design process. Guidelines in this section are based on user studies conducted explicitly for MC-AI systems. This paper first introduces global user preferences and situational user preferences and later gives an in-depth view of their implications for MC-AI system design [37]. Fine-tuning the conversational experience according to the idiosyncrasies of each user's preference stands to offer great effectiveness and satisfaction within such systems. General traits and settings that pertain to language and conversation represent global user preferences. For instance, one user may prefer a formal tone of address while another may prefer something more casual and friendly. This way, an MC-AI system can offer a personally styled and expected experience to the user. In opposition, situational user preferences relate to conversation-context needs because different situations may call for different approaches and levels of formality [38]. For example, one might be very concise and to the point in a professional environment, yet very wordy at a "normal" or social event. Global and situational user preferences should be recognized in designing MC-AI systems for various conversational environments [38]. This way, the system can understand and meet a user's requirements to make an interaction more enjoyable and efficient. It identifies with and caters to these preferences, making it more user-oriented in understanding and catering to the requirements of its users in their social conversational context. User preferences aside, design of MC-AI systems has to take heed of several other factors that range from linguistic and cultural nuances

to technological constraints and even ethical implications. It is by factoring in these elements that designers will be able to develop inclusive and robust MC-AI systems, which in turn will deliver great user experiences [39].

When developing an MC-AI system, one of the critical aspects is to identify the kinds of user preferences that need to be incorporated. This issue has been dealt with in previous works in text-based multi-turn conversation systems. An alternative is to focus on existing global user preferences in a "preference space" if one takes a simple approach. This space consists of multiple dimensions, with each axis reflecting a specific finite preference [40]. Each conversation path generated by the MC-AI system would correspond to a point within this space, and the conversation paths nearest to the user's preference points would be deemed the most favored by the MC-AI system. However, widely utilized MC-AI systems, such as those resembling Google Assistant or chatbot-like frameworks, typically do not incorporate user-specific global preferences into their design [40]. Additionally, studies involving MC-AI users indicate that individuals do not exhibit strong global preferences when it comes to language selection. The situational context of input significantly influences language choices. To ensure that user preferences are not entirely overlooked in the design of the MC-AI system, it is crucial to consider both global user preferences and the specific situational preferences of each individual user.

In addition to identifying the types of user preferences that should be taken into account, it is crucial to grasp how to implement this consideration in the design of MC-AI systems in order to create effective guidelines. Notably, in conventional text-based multi-turn conversational systems, user preference consideration typically occurs during the post-processing phase, utilizing a model-based approach [40]. However, the data synthesis process employed for modeling user preferences in text-based conversational systems incorporates a user-specific post-processing mechanism, which conflicts with the one-session conversational context of MC-AI systems, making this method unsuitable for them. Consequently, this section aims to address the disparity in educational MC-AI design between traditional text-based conversational systems and MC-AI systems by introducing a complementary approach to the conventional model-based method for consideration in MC-AI system design [40].

5 Conclusion

This study explores how multilingual conversational AI influences user preferences and choices. These systems are designed to comprehend and react to human interactions through natural language and behavior. With globalization on the rise, there is a growing demand for adaptable and smart conversational agents that can operate in multiple languages. Nonetheless, the impact of multilingual conversational AI on user decisions has yet to be thoroughly examined. The aim is to investigate how varying language capabilities influence user preferences during interactions with conversational AI. An experimental framework is established, allowing participants to interact with multilingual bots that can answer questions in different languages

and accents. This research evaluates user preferences regarding the language of the bot based on factors such as amusement, competence, and helpfulness. AI is transforming numerous sectors, as organizations leverage it to enhance productivity, efficiency, and user satisfaction. Conversational AI systems represent a form of human–computer interaction that utilizes natural language and behavior. The rise of chatbots and virtual assistants, which can mimic human-like conversations, is notable. These agents interpret user input through written text, spoken language, or gestures, responding appropriately. Advances in technology facilitate the development of intelligent conversational agents capable of retrieving information or generating humidity. Conversational agents are capable of responding in natural human languages, and those that are multilingual can engage in communication across multiple languages. The rise of globalization has led to an increase in human–computer interactions conducted in various languages. In the context of international organizations, these agents are expected to manage inquiries in different languages, along with the associated accents and dialects. While certain virtual assistants, such as Apple's Siri and Microsoft's Cortana, are tailored for specific languages with set accents, other systems possess the ability to converse in several languages. However, it is typically the users, rather than the operators of the agents, who select the language for interaction. Different language speakers exhibit unique preferences regarding the language of communication. This phenomenon has yet to be thoroughly examined in the realm of multilingual conversational AI. The impact of the agent's linguistic capabilities and variations on user preferences is investigated. A novel research model is introduced in the area of multilingual conversational AI, demonstrating its utility and feasibility through a computerized experiment featuring a series of multilingual bots. The findings of this research hold significant and diverse implications. Gaining an understanding of how individuals assign language preferences to conversational agents offers valuable insights for organizations functioning in multilingual settings. Creating conversational agents equipped with suitable language skills, accents, and variations can enhance user satisfaction and improve interaction outcomes. This analysis extends beyond the realm of virtual assistants to encompass any multilingual system, including chatbots and information systems. When formulating multilingual online services, governments can leverage this insight. The results are relevant for designers of multilingual online applications as they strive to reduce language-based discrimination faced by non-native users in a predominantly English-speaking digital environment.

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Technological Advancements in Arabic Language Pedagogy: Bridging the Gap Between Tradition and Innovation



Mohammed Saleem Ismail Al-Mallahma

Abstract This chapter undertakes to fuse the current technological trends with the traditional Arabic language teaching methods to bring about harmony between theoretical and practical aspects of pedagogical approaches. Even as digital humanities gain more ground, theory overshadows practice in language teaching, particularly foreign languages. This study tries to fill this gap by reviewing literature systematically on technological advancements and their integration into Arabic pedagogy. The research design is therefore purely qualitative, adopting a descriptive approach to analyze several frameworks under separate empirical studies and case analyses, later synthesized through an analytical perspective that brings out key themes and trends. It also looks at how technology can bridge the chasm between traditional and innovative teaching methods from a general perspective down to specific insights that could be used as best practices by educators and policymakers. Therefore, it underscores the potential for technology to enhance Arabic language education, fitting into global trends in language learning that had hitherto observed great disparities in perception or application when considering Arabic pedagogy.

Keywords Arabic language pedagogy · Technological integration · Digital humanities · Educational technology · Pedagogical innovation · Online learning

1 Introduction

This chapter will explore how contemporary technological trends can harmonize with traditional language teaching methods, elevating the digital realm from simple rhetoric to a practical, beneficial approach for both commonly taught and less prevalent languages like Arabic. It has been noted that the significant emphasis on theory

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and rhetoric within the digital humanities has hindered a focus on practical application. This chapter seeks to address the perceived imbalance favoring theory over hands-on techniques, confidently transitioning from theoretical concepts to practical implementation, with the goal of motivating other classroom initiatives in the area of Arabic Digital Humanities. When studying or teaching Arabic, it is crucial to take into account the regional factors that influence the process [1].

The experience of South Asians with Arabic is intertwined with traditional teaching approaches, even at the university level, through the lens of the Arabic metaphor for courage. Due to the political implications tied to the Arabic language and its relative infrequency of study compared to languages such as Spanish and French, it becomes essential to creatively integrate tradition within a technologically oriented language learning framework. The significance of Arabic today extends beyond academia to a diverse array of professionals, while the field of Arabic language education is undergoing a kind of renaissance, prompted by journalists and policymakers [2]. This, coupled with the emphasis on technological advancements in the Digital Humanities, underscores the need for a genuinely interdisciplinary approach.

1.1 Research Significance

The importance of this research is that it may bridge a very important gap in Arabic language pedagogy by integrating technological innovations with traditional teaching methods. As the digital humanities are growing in education, practical applications of technology in language learning have been always overshadowed by theoretical discussions. This study will try to fill this gap and bring theory into practice and improve the actual teaching of the Arabic language. Integration of technology into Arabic pedagogy is very important because of the unique cultural and political context of the language, which plays a big role in its teaching methodology. Looking at modern technological tools complementing traditional ways, therefore, this chapter does not only contribute to improving Arabic studies but also responds to the urgent need for innovative pedagogical practices in a new digital era by showing how they can be practically implemented. Such results could be of some inspiration for educators, policymakers, and scholars to bring theories into practice for creating a more effective dynamic context of Arabic language learning.

1.2 Methodology

This research is a qualitative research design that explores the integration of technology within Arabic language instruction. The study is using a descriptive approach to review literature systematically related to technological advancements and their

effect on pedagogy for the Arabic language. The review considers several frameworks, empirical studies, and case analysis to understand how technology can bridge traditional teaching of language with new innovative methods. Coming after the literature review, it applies an analytical approach to synthesis findings by identifying key themes, trends, and implications for future pedagogical practice. Such methodology would give insights into the effectiveness of technological tools and strategies toward improving teaching Arabic as a second language, helping educators/policymakers to integrate best practices in applying technology in teaching Arabic.

2 Overview

This chapter presents a selective overview of the history surrounding the teaching of Arabic as a second or foreign language, drawing from a distinctive historical lens that has aimed over the past few centuries to rejuvenate and refresh older, though arguably antiquated, approaches, methods, and techniques. It examines key figures, contexts, and content related to these traditional methods, alongside some lesser-known, grassroots, and unconventional approaches that have often been overlooked and are largely unpublished. These alternative methods have typically emerged from disillusioned learners of established systems, as well as educators who understand and advocate for these enduring teaching practices. This narrative highlights significant periods, educational schools, and engaging, often contentious debates, while intentionally excluding the pedagogical advancements and innovations of the twentieth century that have greatly shaped contemporary methods and techniques in nearly all languages [2].

For over fourteen centuries, the fully codified, sacred forms of Arabic have predominantly prevailed; however, historical documentation regarding the paradigms of Arabic teaching and learning only emerged with the cultural flourishing of the millennium. This does not imply that Arabic instruction or acquisition was absent prior to 1876, but rather highlights that the caliphate existed in a society primarily reliant on oral traditions and, to some extent, literacy, which did not necessitate a specialized profession for teaching Arabic to those who were not native speakers [2]. Inbal was primarily focused on overseeing the transcription of communications, writing and editing official documents, and training administrative staff in literacy and numeracy [3]. Significantly, philologists, grammarians, lexicographers, and scholars researching Islam benefited from direct access to textual sources, which facilitated their academic progress—these corpora have historically defined Arabic educators and, until relatively recent times, the Arabophone community itself [3].

2.1 Traditional Methods of Teaching Arabic Language

For an extended period, traditionalist approaches have largely shaped the paradigm of Arabic language teaching, focusing on helping students achieve mastery across all aspects of the language, including syntax, vocabulary, dictation, and rhetoric. This upcoming section will explore these time-honored teaching methods that have evolved over time to connect with a new generation of learners. It will cover the Madrasah period, the Mukhtaṣar period, and the late-classical phase of Arabic studies [4]. By aligning the research findings with established traditional practices, the discussion will ultimately propose a seemingly rational shift toward the incorporation of technology.

It is a widely accepted notion, firmly rooted in educational practice, that to grasp the complexities of a classical tradition, one must first acquire a foundational understanding of the oral language, including its syntax, vocabulary, and rhetoric. Oral Arabic held particular significance, necessitating a thorough command of the language starting from the junior year of college. A historical examination of teaching methods over the years shows a gradual and largely implicit shift from oral traditions to literary forms, with particular aspects of grammatical traditions or literature being prioritized during formative years [4]. The upcoming section offers an overview of the nuanced transformations present in pedagogical practices, tracing the evolution from the rhetoric and oral traditions of the Madrasah period, through the Mukhṭaṣar period, and concluding with the late ḥālī period [4]. This discussion is informed by a variety of material sources, including syllabi and lectures.

2.2 Challenges in Arabic Language Pedagogy

The challenges faced in modern Arabic language teaching are numerous and intricate, yet two primary categories emerge from their frequent occurrences in recent research. To begin with, Arabic is regarded as an "exotic" language, bringing forth complexities rooted in its linguistic and historical origins. As the language of the Quran, a foundational understanding of Arabic is essential for any exploration of Islamic culture, history, or its people. Mastering Arabic is deemed challenging, with learning obstacles encompassing its phonological system, the complexities of its syntax, and its sociolinguistic dimensions [5].

The fundamentals of learning the Arabic language present considerable challenges. According to the Department of State, each world language in the "Foreign Service Institute" list is assigned a difficulty index, which indicates the number of hours an English speaker with a European language background will need to attain professional fluency. In the category labeled "High Arabic," the Department of State specifies that students require 2,200 classroom hours to achieve this level of proficiency. Although there is a growing belief that proficiency in Arabic is essential for

numerous careers, businesses, and government roles, learners still encounter significant hurdles. Baehr identifies 14 specific challenges; among these, two pertain to the cultural significance of the language, five relate to the structure of Arabic itself, while the remaining seven involve broader contexts surrounding Arabic, such as land, global initiatives, and military endeavors [5].

3 Emergence of Technology in Language Teaching

In contemporary life, the integration of new technologies is becoming increasingly prevalent across various domains, including education. This broader trend has led to the incorporation of technology in language instruction, providing educators with the chance to engage students through culturally relevant and often personally inspiring mediums. Additionally, it allows for the accommodation of a wide range of learning styles, multiple intelligences, and preferences within an audio-visual environment. This section introduces our investigation into the next-wave technologies utilized in teaching the Arabic language. In the subsequent sections, we will outline four specific categories of technology that we consider to be most significant in the current landscape: Interactive Whiteboards, Asynchronous Multimedia, Virtual Worlds, and Linguistic Corpus Tools [6].

During the 1940s, new technologies, particularly audio-lingual practice through vinyl records, transformed language teaching. Although these innovations were not initially intended for educational settings, by the late 1950s, they became central to a method known as the audio-lingual approach, characterized by the repetition of sentences in the target language as the main teaching strategy. The following significant advancement in technology emerged in the 1970s with the introduction of video. Initially, upper-level classes utilized movies and television series as receptive materials. The rise of home video marked a pivotal moment in technological language instruction [7]. In the United States, videos were employed in classrooms to teach frequently used vocabulary and idiomatic expressions found in everyday conversation.

3.1 Digital Tools and Resources for Arabic Language Learning

The evolution of digital technology has significantly altered classical communication, continuously reshaping it into strategies rooted in transformative digital practices that intersect with tools utilized in foreign language teaching, including Arabic. This shift has profoundly influenced the development of instructional methods and resources for Arabic, transitioning from conventional classroom teaching to digital pedagogy that enhances both classroom instruction and the learning experiences

of students. While many of these resources originate from the dedicated efforts of professional developers within institutions, a considerable number are produced by the practitioners themselves. To guarantee their quality, most of these resources undergo either peer review or thorough evaluation [8].

The advancement of digital resources and tools for teaching and learning Arabic can be categorized into three distinct groups. The first category includes digital resources designed for the traditional classroom environment, such as interactive whiteboards and digital games. The second category encompasses digital content tools for courses that can be applied in flipped classroom models. Finally, the third category features out-of-classroom digital tools, including online discussion boards, distinct feedback mechanisms, and what is known as the virtual classroom. The significance of the first category cannot be underestimated, as it supports both instructors and students in settings that are still widely used for providing and enhancing input. Meanwhile, the third category facilitates opportunities for learning and interaction with peers outside of the classroom. This classification of digital technology resources sheds light on the influence of digital pedagogy in Arabic language instruction [8]. It is noted that resources that are heavily utilized are increasingly present in both classroom environments and beyond.

3.2 Online Platforms and Applications for Arabic Language Learning

Platforms available online for learning Arabic typically feature a variety of resources, including short videos, podcasts, interactive quizzes, comprehensive tutorials on Arabic grammar, and cultural insights. These platforms may offer free access or have a tiered system with both free and premium subscription options. Presently, among the most well-known Arabic language learning platforms are Y taperu, Duolingo, Pimsleur, Rocket Languages, Babbel, Busuu, Rosetta Stone, Ouino Arabic, Learn Arabic with Maha, My Arabic, Mango, BBC Arabic, Lang Media, and Arch Arabic [8]. While some of these platforms utilize a masterclass approach to instruction, others often adopt a drill-and-practice method.

Beyond traditional language learning platforms, there is a wealth of specialized applications dedicated solely to acquiring the Arabic language. This category encompasses not only the well-known platforms previously mentioned but also includes extensive Arabic dictionaries, word processing tools, Islamic applications, Quranic study resources, and even augmented-virtual reality (AR/VR) applications tailored for Arabic learning [9]. Collectively, these digital tools form an ecosystem that can be both daunting and empowering for Arabic learners. The increasing appeal of these mobile applications and online platforms clearly indicates that Arabic language students are taking advantage of the opportunities available in the digital realm, marking a significant departure from conventional classroom-based language courses and textbooks.

3.3 Virtual Reality and Augmented Reality in Arabic Language Education

In recent years, there has been a notable rise in the adoption of immersive technologies across various sectors, particularly in education. The surge in the application of virtual reality and augmented reality within language education is particularly striking. These immersive environments enhance opportunities for constructivist and activity-based teaching in interactive, student-focused learning settings. A distinctive aspect of both virtual and augmented reality is their ability to create simulations of experiences and activities that students would otherwise be unable to encounter. While virtual reality environments are entirely computer-generated and present challenges in engaging with second language (L2) learning as well as replicating real-world contexts, augmented reality (AR) merges virtual elements, scenes, or characters with actual environments that students can see and interact with, making it effective for involving learners in real-world contexts [9].

Augmented reality (AR) is continually advancing, and many educational systems have begun to incorporate AR-enabled classrooms into language education. Currently, the application of AR in AAPE is minimal, yet it holds significant potential to revolutionize the environment where Arabic language instruction occurs. AR can connect real-world settings, allowing for the creation of AR Labs that offer exposure to scenarios that are typically unfeasible in traditional classrooms and labs. The integration of AR in AAPE can particularly enhance the merging of real and virtual realms, enabling learners to experience reality in a distinctive and immersive manner [9]. This approach will allow students to engage with diverse vocabulary sets from various regions within MENA.

4 Technology Applications

4.1 Gamification in Arabic Language Learning

The field of language learning research has increasingly focused on gamification due to its capacity to captivate learners. This engaging pedagogical approach has been demonstrated to enhance student motivation and participation. Various interfaces, such as gamified mobile applications, computer-assisted language learning (CALL), intelligent educational hypermedia systems, and virtual worlds, contribute to this engaging learning experience. Additionally, the intersection of technology and language education has carved out a new space with the rise of mobile visual dictionaries and flashcard creation applications. The incorporation of game elements and mechanics has attracted interest for its impact on language acquisition, influencing both motivation and effectiveness in learning languages and extracurricular pursuits [10]. In particular, gamified edutainment has been employed and recognized as a promising pedagogical method for Arabic. However, despite acknowledging

its potential, there remains a scarcity of research exploring the implementation of gamification within Arabic language teaching.

The term gamification refers to the integration of game elements and principles of digital game design into contexts that are not inherently games. By utilizing its mechanics and frameworks, gamification incorporates digital game elements into standalone systems, focusing on game dynamics (actions, behaviors) and game design (user interface, enjoyment) [10]. Elements such as opponent reward systems, micro-progression, storytelling, attachment and loyalty, competitive mechanisms, problem-solving, executed actions, and themes of game enhancement have contributed to the application of game theory's digital design within educational environments. Game mechanics articulate the game elements in a manner that informs the design of the game [10]. They embody the fundamental rules and basic operations or components that may function within a game. In the context of digital design through gamification, these game mechanics typically showcase a collection of rules or tools intended to deliver feedback, encourage competition and rewards, and facilitate the application of higher-order thinking skills through simulation [11].

4.2 Mobile Applications for Arabic Language Learning

Mobile applications, commonly referred to as apps, function as multimedia mini-programs that are initiated and utilized on mobile devices. Their capabilities for interactivity and connectivity make them exceptionally valuable for independent and remote language learning. In this era of globalization, apps offer numerous benefits, especially for learning Arabic, as they can address the challenges of accommodating various learning styles, needs, and areas of difficulty. Regularly updated apps can significantly contribute to the distribution of new language input and enhance awareness of cultural events, customs, and traditions [11]. Advocates of computer-assisted language learning technology assert that smartphones and tablets enable students to engage with the target language more often, for extended durations, and in a wider range of environments compared to what is achievable with a laptop or desktop computer.

Nonetheless, the use of mobile applications to address feelings of alienation or to assist learners in developing authentic language skills that align with their learning environment is not a straightforward task [12]. Often, the creators of these educational apps appear to view language learners as a uniform group, possessing a singular set of goals and needs. In truth, it may be necessary to design and implement a range of apps to meet the diverse demands of various target language learning situations, as well as the differing learning styles and requirements of individuals, including adults, children, and tourists. For instance, apps can be tailored to fulfill the needs of adult professionals seeking to accelerate their learning journey by acquiring new vocabulary and showcasing their skills, which would significantly contrast with the learning experiences of children.

4.3 Artificial Intelligence and Machine Learning in Arabic Language Pedagogy

In the realm of pedagogy, artificial intelligence and machine learning technologies are relatively recent innovations. The notable progress in these areas suggests that educators will increasingly incorporate AI technologies and machine learning algorithms to elevate educational instruction [13]. In the field of language pedagogy, numerous AI technologies are now more closely connected. These include chatbots, language translators, and language correction tools, all of which are combined with instructional resources such as MOOCs. The advances in AI and machine learning are primarily fueled by the expanding interdisciplinary domain of AI and Education, commonly known as Intelligent Tutoring Systems (ITS). Within ITS, researchers are creating various AI-driven systems and tools capable of analyzing student learning behaviors and patterns to offer pedagogically adaptive assistance. These systems align with modern learning theories, allowing for adaptations in instruction based on a student's learning style, thereby fostering a more personalized educational experience. The overarching goal is to enhance and individualize pedagogy in ways that are not typically accessible to classroom educators [14].

Considering the varied ethnicities, dialects, and religious beliefs across 26 Arabic countries, the integration of AI in teaching the Arabic language to non-native speakers (NNS) has the potential to transform traditional instructional methods into modern ones. The intricate nature of the Arabic language allows for a more operational understanding, enabling deeper exploration by researchers in Arabic pedagogy, dialectology, and sociolinguistics regarding language relevance. The goal of automating the teaching process is not to replace language educators but rather to free them from monotonous and repetitive tasks, thereby enabling them to concentrate on cultivating the intellectual development of their students. These increasingly integrated learning technologies could prove highly advantageous for Primary and Secondary Arabic education. Aiming to personalize pedagogy, these AI and IT systems are poised to significantly influence the traditional methods of language learning within the Arabic-speaking world. For example, such systems may have the capability to anticipate users' preferences even without explicit input, as they may have amassed extensive datasets over the years that link specific preferences to successful learning outcomes [15].

5 Approaches

5.1 Adaptive Learning Systems for Arabic Language Education

The literature on educational research highlights that paying attention to the capabilities, needs, and preferences of individual students is a frequently mentioned characteristic in lessons designed to engage and include learners. Numerous studies we reviewed place significant emphasis on adaptive or personalized learning and instruction through various technologies and platforms. Additionally, current research indicates that exemplary lessons can serve as a criterion for assessing adaptive learning market solutions. Adaptive learning systems enable customization and create a distinct learning pathway tailored to each student's requirements [16]. This customization can be accomplished through rule-based, knowledge-based, or data-driven personalization, influenced by the specific domain, study, and focus of the relevant research. This investigation centers on utilizing such technologies to identify and address the unique learning needs of diverse ASE learners. With the rising number of Arabic language learners from non-native backgrounds, adaptive systems could play a vital role in accommodating their varied learning needs and backgrounds.

The growing population of learners studying the Arabic language necessitates proficient educators equipped with a variety of techniques that enhance learners' abilities within the rich heritage of Arabic. Often, technology-driven methods are contrasted with conventional face-to-face instruction. Nevertheless, some teachers are leveraging these modern tools to create new teaching strategies that align with their established principles. Numerous educators have noted that utilizing innovative Computer Assisted Language Learning (CALL) technology for online assessments can lead to L2 Arabic evaluation methods that are seen as more engaging [17]. There is hope that this approach may help alleviate students' longstanding aversion to assessments. Therefore, upcoming RES camp initiatives should focus on further refining Arabic language teaching while also strengthening the overall support framework for Arabic educators.

5.2 Blended Learning Approaches in Arabic Language Pedagogy

Blended learning exists at the convergence of three key areas that are intended to work together synergistically. These areas encompass the integration of conventional and digital learning settings within our classrooms; transformational elements, marked by the numerous tools available to innovate our teaching practices; and a global perspective, allowing for potential integration across schools, universities, workplaces, and beyond. This definition emphasizes the role of technology in enriching

the conventional instruction of specific subjects. In this instance, blended learning refers to the fusion of traditional language teaching techniques with digital resources and tools in the instruction of the Arabic language [17].

Defining blended learning in this manner suggests that traditional methods of teaching the Arabic language were flawless, indicating no significant need for change. A review of the literature reveals numerous arguments supporting traditional pedagogy, along with evidence of its effectiveness [18]. The role of technology in Arabic instruction is to enhance these conventional methods whenever feasible and to propose alternatives when needed. In our context, technology is "woven throughout the course to improve classroom instruction, involve students, and offer an alternative means of communication and collaboration with learners" [18].

6 Assessment and Training

6.1 Assessment and Evaluation in Technology-Enhanced Arabic Language Teaching

In the realm of education and training, assessment and evaluation serve as crucial elements, particularly in measuring learning outcomes. They highlight the expected knowledge that learners should acquire based on instructional goals, while evaluation encompasses both the effectiveness of teaching and the learning achieved. It is vital for teacher-candidates to grasp these two aspects of the educational process, as instructors will invariably engage in both. The terms assessment, measurement, and evaluation are often used interchangeably [18]. Many dictionaries in the English language treat these words as synonyms; however, each carries a distinct meaning. Assessment refers to the actual evaluation or measurement, while measurement denotes the process through which assessment or evaluation occurs, and evaluation signifies the judgment of the assessment scores or numerical outcomes. Consequently, distinguishing clearly among these terms can be challenging [18].

In this era of technology, the significance of these concepts in classrooms is heightened to effectively measure learning outcomes within digitally-integrated language instruction. Education is indeed inundated with technological innovations. Moreover, advances in information and communication technology (ICT) have unveiled new opportunities for formative assessment, enabling educators to employ innovative tools that align with the constructivist paradigm [19]. Additionally, technology empowers educators to personalize learning experiences more effectively, providing enhanced assessment and support moments related to students' educational journeys. In this context, technology-enhanced teaching is viewed as a supportive framework that equips students with familiar information technology interfaces, integrating learning resources while fostering interactions among students, faculty, and content to create a successful educational experience. Considering this brief overview of formative assessment, it is crucial to address the complexities and challenges

involved in assessing students within an ICT-integrated Arabic language learning and teaching environment, particularly in exploring how more computer-friendly testing conditions could aid in measuring grammar and vocabulary [19].

6.2 Teacher Training and Professional Development in Technology-Enhanced Arabic Language Teaching

In the vast body of research surrounding technology-enhanced teaching and learning, the training and professional development of teachers are regarded as the most crucial elements for achieving lasting change in any educational reform. It is essential for educators to possess the skills, knowledge, and abilities required to effectively utilize specific technologies and to incorporate them into their teaching practices in pedagogically sound ways. This necessity applies equally to the integration of technology in language instruction and the facilitation of language acquisition [20]. The domain of Technology Enhanced Language Learning (TELL) has garnered interest from scholars globally, including those focused on Arabic language education, due to its potential to address educational limitations, support both teachers and learners, and resolve educational challenges [21]. However, the assumption that incorporating technology into Arabic language instruction will enhance student motivation, engagement, and learning while advancing the quality of contemporary education hinges on teachers' proficiency with the relevant technologies [21]. Engaging in teacher training and professional development within Arabic studies can yield significant advantages for teacher education [22, 23].

The necessity of professional development for teachers has reached an unprecedented level of significance, particularly in light of the global responses to the COVID-19 pandemic [24]. The overwhelming dependence on technology to ensure educational continuity has highlighted deficiencies in teachers' pedagogical skills, thus underscoring the need for ongoing professional development. It is essential to recognize that training for teachers in this domain must extend beyond their initial qualifications, leading to the emergence of a specialized field in technology-enhanced Arabic Language Studies. Considering the dual relevance of Arabic Studies in the UK today—Arabic being a crucial global language and also a language spoken by a substantial population within the UK—the urgency to explore pedagogical innovations in teaching Arabic to non-native speakers by Arabic instructors has never been more critical [24, 25].

7 Conclusion

The integration of technology into Arabic language teaching now holds significant pedagogical and social implications. This innovative area has transitioned from a modest beginning to making a considerable global impact on online Arabic education. Currently, and particularly in recent years, technology is no longer constrained by the limitations of time and space, which has now permeated Arabic language pedagogy. As a result, this shift has profoundly transformed both the Arabic classroom environment and the learning of Arabic beyond formal education settings. This chapter aims to highlight the Enlightenment era's implicit recognition of the Arabic language as unique and distinct from other languages, addressing the disparity between this traditional perspective and the contemporary, technology-driven landscape of online Arabic learning. It is crucial to understand this gap not simply as a static divide but as a dynamic space that can be bridged, connecting the historical perception of Arabic with the more modern and expansive views of language acquisition. Therefore, the Arabic language, along with the rise of new media and digital globalization, has the potential to unite these two perspectives, reflecting broader trends in language learning. Research conducted previously in this domain has highlighted a disparity between L1 and L2, indicating the necessity for a harmonization tool to address this issue. Modern online resources and technology-based pedagogy play a crucial role in this context. Teachers in the twenty-first century, along with skills training, can effectively support these two components, guiding learners in enhancing their abilities to comprehend various forms of texts and lines, as well as writing them according to the demands of the target language. In recent years, the long-standing perception of the Arabic language, which has been viewed as 'unequal' and less conducive to learner engagement by 'Orientalists,' has started to shift. The prominent role of Arabic as a valuable medium for communication in media and within political and social contexts has led individuals who once overlooked the language to recognize its usefulness and significance.

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Post Quantum Cryptography: Preparing for the Quantum Era



Agnibha Chakraborty, Mohammad Kouali, and Ashraf Shaqadan

Abstract Quantum computing threatens the security of classical cryptographic systems, necessitating the development of post-quantum cryptography (PQC) to secure digital communications and data. This paper explores the principles and techniques of PQC, focusing on key algorithms such as lattice-based, code-based, hash-based, and multivariate polynomial-based cryptography. The study examines the vulnerabilities of current cryptographic systems to quantum attacks, particularly through Shor's algorithm, and highlights the advancements in the NIST PQC standardization efforts. Practical implementations and performance evaluations of PQC are discussed, showcasing their resilience against quantum threats. The paper also addresses challenges in transitioning to PQC, including computational complexity and key management. Future research directions and potential advancements in PQC are outlined, emphasizing the need for continued innovation to ensure robust security in the quantum computing era.

Keywords Post-quantum cryptography (PQC) · Quantum computing · Shor's algorithm · Lattice-based cryptography · Code-based cryptography · Hash-based cryptography · Multivariate polynomial cryptography · NIST standardization · Cryptographic security · Quantum-resistant algorithms · Digital communications

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security · Key management · Computational complexity · Future cryptographic systems · Technological progress

1 Introduction

Quantum computing, heralded as a transformative technological advancement, poses a significant threat to contemporary cryptographic systems by exploiting quantum mechanical principles to solve complex problems more efficiently than classical computers [1]. This capability, exemplified by Shor's algorithm, challenges the security of widely-used cryptographic methods such as RSA and elliptic curve cryptography (ECC), which rely on computationally intensive problems like integer factorization and discrete logarithms [2–4]. As quantum computers approach practical feasibility, it becomes crucial to address these vulnerabilities through post-quantum cryptography—an emerging field dedicated to developing cryptographic algorithms resilient to quantum attacks [5–7]. This paper aims to explore and analyze various post-quantum cryptographic techniques, evaluating their theoretical foundations and practical implementations to secure data in the anticipated quantum era. The scope encompasses a review of the current state of post-quantum cryptographic research, its theoretical underpinnings, and the ongoing efforts to standardize these algorithms for future-proofing against quantum threats.

2 Literature Review

Classical cryptographic algorithms, such as RSA and elliptic curve cryptography (ECC), form the cornerstone of secure digital communications by leveraging the computational difficulty of specific mathematical problems [8, 9]. RSA's security depends on the challenge of factoring large composite numbers, while ECC relies on the difficulty of solving the elliptic curve discrete logarithm problem [10, 11]. These problems are hard for classical computers to solve efficiently, ensuring the security of these cryptographic systems [12]. However, quantum computing introduces significant vulnerabilities, particularly through Shor's algorithm, which can solve these problems exponentially faster, thereby threatening the security of RSA and ECC [13, 14].

Quantum computing leverages the principles of superposition and entanglement from quantum mechanics. Superposition allows quantum bits (qubits) to exist in multiple states simultaneously, unlike classical bits confined to binary states [15, 16]. Entanglement enables entangled qubits to instantly affect each other's states regardless of distance, enhancing computational power [17]. Quantum computers can process many calculations simultaneously, offering exponential speedups for problems crucial to cryptography [3, 4, 18]. The need for post-quantum cryptography stems from the imminent threat posed by quantum computers to classical

cryptographic systems [19]. As quantum computing advances, the risk of quantum attacks grows, necessitating cryptographic algorithms secure against both classical and quantum attacks [20]. Post-quantum cryptography aims to create protocols that withstand quantum computing capabilities, ensuring the confidentiality and integrity of information in the quantum era [5, 6, 21].

Current research in post-quantum cryptography is robust, focusing on various approaches to ensure resistance to quantum attacks. Notable schemes include lattice-based, code-based, hash-based, and multivariate polynomial cryptography [22]. Lattice-based cryptography relies on the hardness of lattice problems, code-based cryptography uses error-correcting codes, hash-based cryptography leverages cryptographic hash functions, and multivariate polynomial cryptography involves solving systems of multivariate polynomial equations, all believed to be resistant to quantum attacks [7, 8, 23].

Standardization efforts led by the National Institute of Standards and Technology (NIST) through its Post-Quantum Cryptography Standardization Project are crucial in evaluating and standardizing quantum-resistant cryptographic algorithms [24]. This research aims to identify and standardize public-key cryptographic algorithms secure against quantum computing threats, ensuring that practical and robust cryptographic solutions are available before large-scale quantum computers become operational.

3 Technical Overview

3.1 Quantum Threats to Cryptography

Quantum computing, with its ability to process complex calculations at unprecedented speeds, poses significant threats to classical cryptographic systems [25]. Quantum algorithms, particularly Shor's algorithm, can efficiently solve problems that underpin the security of widely used cryptographic protocols such as RSA and ECC (Elliptic Curve Cryptography) [26]. Shor's algorithm enables the factorization of large integers and the computation of discrete logarithms in polynomial time, rendering classical cryptographic systems vulnerable to quantum attacks [1, 27].

The core principle of Shor's algorithm is its ability to exploit quantum superposition and entanglement to perform parallel computations [28]. Classical cryptographic systems rely on the difficulty of these problems, assuming they are infeasible to solve in reasonable time with classical computers [29]. However, quantum computers can solve these problems exponentially faster, thus necessitating the transition to post-quantum cryptography (PQC) [30].

3.2 *Post Quantum Cryptographic Algorithms*

The development of post-quantum cryptographic algorithms aims to address the vulnerabilities introduced by quantum computing [31]. These algorithms are designed to be secure against both classical and quantum attacks. The main types of post-quantum cryptographic algorithms include lattice-based cryptography, code-based cryptography, hash-based cryptography, multivariate quadratic equations, and supersingular elliptic curve isogeny [32].

Lattice-Based Cryptography: Lattice-based cryptography is one of the most promising approaches in PQC. It relies on the hardness of problems related to lattices, such as the Learning With Errors (LWE) problem and the Shortest Vector Problem (SVP) [33]. The LWE problem involves finding a secret vector given a set of linear equations with small errors, while the SVP requires finding the shortest non-zero vector in a lattice [2, 34]. One of the key advantages of lattice-based cryptography is its versatility, enabling the construction of various cryptographic primitives, including encryption schemes, digital signatures, and fully homomorphic encryption [35]. The NIST post-quantum cryptography standardization process has seen several lattice-based submissions, such as Kyber and Dilithium, which have shown promising security and performance characteristics [3, 36].

$$A \cdot s + e = b \,(\mathrm{mod}\, q). \tag{1}$$

where: A is a public matrix, s is the secret vector, e is the error vector and b is the resultant vector (Table 1).

Code-Based Cryptography: Code-based cryptography leverages the hardness of decoding random linear codes, which is another problem believed to be resistant to quantum attacks. The most well-known code-based cryptographic system is the McEliece cryptosystem, which uses Goppa codes, error-correcting codes to secure data. The security of the McEliece cryptosystem is based on the difficulty of decoding a general linear code, a problem that has remained intractable even for quantum algorithms. Code-based cryptography offers several advantages, including high-speed encryption and decryption processes, making it suitable for applications requiring fast data transmission and low latency [37]. Additionally, code-based systems have a long history of cryptographic security, providing confidence in their resilience against quantum attacks [5, 38].

Algorithm:
Key Generation: Generate a random Goppa code G and a scrambling matrix S.
Encryption: Encode the plaintext using G and add random error vector.
Decryption: Decode the received codeword using the private key and correct the errors.

Hash-Based Cryptography: Hash-based cryptography relies on the security properties of cryptographic hash functions. It is one of the oldest and most well-understood post-quantum cryptographic approaches. Hash-based digital signatures, such as the

Merkle signature scheme and the XMSS (eXtended Merkle Signature Scheme), provide security based on the collision resistance and preimage resistance of hash functions. These schemes are particularly attractive for their simplicity and strong security guarantees. Hash-based cryptography is highly efficient in terms of computational requirements and can be used in various applications, including secure communication protocols and data integrity verification [39]. One limitation of hash-based schemes is that they typically require relatively large signature sizes and key management complexities, which must be addressed in practical implementations [6, 7, 40] (Fig. 1 and Table 2).

Multivariate Quadratic Equations: Multivariate quadratic (MQ) cryptography is based on the difficulty of solving systems of multivariate polynomial equations over finite fields. The security of MQ cryptographic schemes arises from the computational hardness of finding solutions to these equations, a problem that remains challenging for both classical and quantum computers. MQ cryptography includes schemes such as the HFE (Hidden Field Equations) and the Rainbow signature scheme [41]. These algorithms are known for their efficiency in key generation and signing processes, making them suitable for environments with constrained computational resources. Additionally, MQ cryptographic schemes offer strong security properties and have been extensively studied for their resistance to various types of attacks [8].

Mathematical Representation:

$$\mathrm{Pi}(x_1, x_2, \ldots, x_n) = \sum_{j \le k} a_{i,j,k} x_j x_k + \sum_{j} b_{i,j} x_j + c_i \tag{2}$$

where: Pi are the quadratic polynomial, $a_{i,j,k,}$ $b_{i,j,}$ c_i are the coefficients.

Supersingular Elliptic Curve Isogeny: Supersingular elliptic curve isogeny (SI) cryptography is a relatively recent development in post-quantum cryptography. It involves the use of isogenies between supersingular elliptic curves to construct cryptographic primitives. The security of SI cryptographic schemes is based on the difficulty of computing isogenies between given supersingular elliptic curves, a problem that is hard for both classical and quantum computers. SI cryptography offers several promising features, including small key sizes and strong security guarantees. One notable application of SI cryptography is the SIKE (Supersingular Isogeny Key Encapsulation) protocol, which is designed for secure key exchange. SIKE and other SI cryptographic schemes are actively being researched and standardized for practical deployment [9, 10].

Mathematical Representation:

$$E_0 - E_1 - E_2 - E_3 - \ldots - E_n \tag{3}$$

where: Ei represents the supersingular elliptic curves and the arrows denote the isogenies between them (Table 3).

The rise of quantum computing necessitates the transition to post-quantum cryptographic algorithms to ensure the continued security of digital communications. Each type of post-quantum cryptographic algorithm offers unique advantages and

challenges, making it essential to evaluate their suitability for different applications. Ongoing research and standardization efforts are critical to developing robust and practical cryptographic solutions that can withstand the capabilities of quantum computers. By understanding and implementing these post-quantum cryptographic algorithms, we can secure our digital infrastructure against future quantum threats.

4 Applications

Post-quantum cryptography (PQC) plays a crucial role in safeguarding various aspects of digital security against the emerging threats posed by quantum computing. Its applications span across secure communications, data encryption, digital signatures, and blockchain technology. This section provides a detailed overview of how PQC is applied in these domains, highlighting its significance and implementation considerations.

4.1 Secure Communications

Secure communications are fundamental to maintaining confidentiality and integrity in digital interactions. With the advent of quantum computing, classical encryption methods such as RSA and ECC are at risk of being compromised [41]. PQC aims to address these vulnerabilities by offering cryptographic systems that are resistant to quantum attacks [42].

Post-quantum cryptographic algorithms can be integrated into secure communication protocols to ensure that data transmitted over networks remains protected against quantum threats [43]. For instance, lattice-based encryption schemes like NTRUEncrypt offer robust security properties and efficient performance, making them suitable for use in secure messaging applications [1]. Additionally, protocols like Transport Layer Security (TLS) can incorporate PQC algorithms to safeguard data in transit, ensuring that future quantum computers cannot decrypt sensitive information [2].

Quantum-Safe Key Exchange: In secure communications, key exchange protocols are fundamental. The Diffie-Hellman key exchange, commonly used today, is vulnerable to quantum attacks. Post-quantum algorithms such as the Supersingular Isogeny Diffie-Hellman (SIDH) provide quantum-safe key exchange mechanisms [7].

Mathematical Representations:

- Alice: $P_A = E \times S_A$
- Bob: $P_B = E \times S_B$
- Shared Key: $K = P_A \times S_B = P_B \times S_{A.}$

Where: E is the elliptic curve, and S_A and S_B are the private keys of Alice and Bob respectively.

Encrypted Messaging: Encrypted messaging applications require robust encryption algorithms to ensure the confidentiality and integrity of messages. Lattice-based cryptographic schemes, such as Kyber, offer secure encryption mechanisms that are resistant to quantum attacks [2].

Algorithm:
Key Generation: Generate a public–private key pair using lattice-based algorithms.
Encryption: Encrypt the message using the receipt's public key.
Decryption: Decrypt the received ciphertext using private key (Fig. 2).

4.2 Data Encryption

Data encryption is critical for protecting sensitive information from unauthorized access. Traditional encryption methods are vulnerable to quantum attacks, making it imperative to transition to PQC algorithms that offer quantum resistance. PQC algorithms like code-based cryptography and hash-based cryptography are being utilized to encrypt sensative data. For example, the McEliece cryptosystem, a prominent code-based scheme, provides strong security guarantees and is well-suited for encrypting large volumes of data. Its security relies on the difficulty of decoding random linear codes, which remains challenging even for quantum computers [3].

File Encryption: Lattice-based cryptographic systems, such as NewHope, can be used for encrypting files. These systems provide strong security guarantees by relying on the hardness of lattice problems [3].

Mathematical Representation:

$$C = E_k(M) \tag{4}$$

where: C is ciphertext, E_k is the encryption function using key k and M is the plaintext message.

Database Encryption: Databases containing sensitive information, such as financial or medical records, require robust encryption schemes to protect data at rest. Code-based cryptographic systems, like those derived from the McEliece cryptosystem, are suitable for encrypting large datasets [4].

Algorithm:
Key Generation: Generate a public–private key pair using code-based algorithm.
Encryption: Encrypt the database entries using the public key.
Decryption: Decrypt the entries using private key (Table 4).

4.3 Digital Signatures

Digital signatures ensure the authenticity and integrity of digital documents. Post-quantum cryptographic algorithms provide secure digital signature schemes that are resistant to quantum attacks.

Document Signing: Hash-based signature schemes, such as the Merkle Signature Scheme (MSS), provide secure digital signatures by leveraging the security of hash functions [5].

Algorithm:
Key Generation: Generate a set of hash-based public–private key pairs.
Signing: Create a digital signature by signing the document with a private key.
Verification. Verify the signature using the corresponding public key (Fig. 3).

Code Signing: Code signing is essential for verifying the integrity and authenticity of software. Multivariate quadratic (MQ) cryptography, such as the Rainbow signature scheme, provides strong security for code signing applications [6].

Mathematical Representation:

$$\sigma = S^{-1}(H(M)) \tag{5}$$

where: σ is the signature, S is the secret key, H is the hash function, M is the message.

4.4 Blockchain

Blockchain technology relies on cryptographic techniques to ensure the security and integrity of transactions. Post-quantum cryptography can address the vulnerabilities posed by quantum computing to blockchain systems.

Quantum-Resistant Blockchain

Supersingular elliptic curve isogeny (SI) cryptography can be integrated into blockchain protocols to provide quantum resistance. This approach secures the blockchain against potential quantum attacks [7].

Secure Smart Contracts

Smart contracts, which automate and enforce agreements on the blockchain, require robust cryptographic mechanisms. Lattice-based and hash-based cryptographic schemes ensure the security and integrity of smart contracts in a quantum computing environment [2, 5].

Algorithm:
Contract Creation: Create a smart contract using post-quantum cryptographic algorithms.
Execution: Execute the contract on the blockchain.

Validation: Validate the contract's execution using quantum-resistant verification methods.

Post-quantum cryptography offers robust solutions for securing communications, data encryption, digital signatures, and blockchain technology against quantum computing threats. By leveraging various post-quantum cryptographic algorithms, such as lattice-based, code-based, hash-based, multivariate quadratic, and supersingular elliptic curve isogeny cryptography, we can ensure the security and integrity of digital systems in the quantum era.

5 Benefits and Challenges

5.1 Benefits

Enhanced Security: Post-quantum cryptography (PQC) provides enhanced security by leveraging mathematical problems that are hard for both classical and quantum computers to solve. This ensures that cryptographic systems remain secure even against the capabilities of quantum computers, which can break traditional cryptographic systems such as RSA and ECC [1].

Mathematical Representation:

$$\begin{aligned} &\text{Public Key}: \ A.S + e = b(\text{mod}\, q) \\ &\text{Private Key}: \ s, e \end{aligned} \tag{6}$$

where: A is the public matrix, s is the secret vector, e is the error vector, b is the resultant vector.

Future-Proofing Against Quantum Attacks

PQC algorithms are designed to be secure against future quantum attacks, providing a long-term solution for cryptographic security. As quantum computing technology advances, the need for quantum-resistant algorithms becomes more critical. Implementing PQC ensures that data and communications remain secure well into the future, even as quantum computers become more powerful and accessible [2].

Maintaining Data Integrity: Ensuring data integrity is a fundamental aspect of cryptographic systems. PQC algorithms provide robust mechanisms to verify the authenticity and integrity of data, preventing tampering and unauthorized modifications. This is particularly important in applications such as digital signatures and secure communications, where data integrity is crucial [3].

5.2 Challenges

Computational Complexity: One of the significant challenges of PQC is its computational complexity. Many post-quantum algorithms, such as lattice-based cryptography, involve complex mathematical operations that require substantial computational resources. This can impact the efficiency and performance of cryptographic systems, particularly in resource-constrained environments [4].

Algorithm:
Encryption: $C = E_k(M)$
Decryption: $M = D_k(C)$.

Where: C is the ciphertext, E_k is the encryption function using key k, M is the plaintext message, D_k is the decryption function.

Performance Issues: The increased computational requirements of PQC algorithms can lead to performance issues, including slower encryption and decryption processes. This is particularly problematic for applications requiring real-time processing, such as secure communications and online transactions. Optimizing PQC algorithms to balance security and performance is an ongoing research area [5].

Implementation Difficulties: Implementing PQC algorithms in existing systems presents several challenges. These include integrating new cryptographic primitives with legacy systems, ensuring compatibility across different platforms, and addressing the increased key sizes associated with many PQC schemes. Additionally, developers need to be trained in post-quantum cryptographic techniques, which can add to the complexity [6].

Need for Standardization: Standardization is crucial for the widespread adoption of PQC. The NIST post-quantum cryptography standardization process aims to evaluate and recommend secure cryptographic algorithms for the post-quantum era. However, achieving consensus on the best algorithms and ensuring they meet diverse application requirements is a complex and time-consuming process. Until standards are established, the adoption of PQC may be slow [7].

Post-quantum cryptography offers significant benefits in terms of enhanced security, future-proofing against quantum attacks, and maintaining data integrity. However, challenges such as computational complexity, performance issues, implementation difficulties, and the need for standardization must be addressed to fully realize the potential of PQC. Continued research and development are essential to overcome these challenges and ensure the security of cryptographic systems in the quantum era.

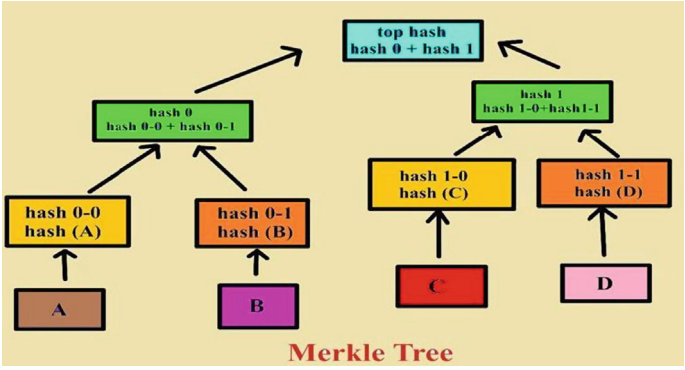


Fig. 1 This figure represents a Merkle Tree

6 Conclusion

Post-quantum cryptography (PQC) is crucial for countering the threats posed by quantum computing to traditional cryptographic systems. As quantum computers advance, they can break classical encryption and digital signature schemes, necessitating a shift to quantum-resistant methods. PQC includes a variety of algorithms such as lattice-based, code-based, hash-based, multivariate quadratic equations, and supersingular elliptic curve isogeny methods, which ensure data confidentiality, integrity, and authenticity [1–3].

Integrating PQC into existing systems is vital for maintaining secure communications, data encryption, digital signatures, and blockchain technologies [4, 5]. By adopting PQC, organizations can future-proof their security against quantum threats. However, PQC algorithms often face challenges related to computational complexity and performance overhead. Research should focus on optimizing these algorithms to reduce key sizes and computational requirements while maintaining security [6].

Practical deployment of PQC involves addressing implementation difficulties and ensuring compatibility with existing systems. Future work should explore hardware and software optimizations for seamless integration and develop tools and standards for widespread adoption [7]. Collaboration with standardization bodies like NIST is essential for creating widely accepted PQC standards [89. As quantum computing evolves, continuous research is necessary to identify and mitigate new threats, ensuring PQC's ongoing effectiveness [10].

In summary, PQC is vital for securing digital information against quantum threats, ensuring data protection, integrity, and authenticity. Future research should enhance algorithm efficiency, develop practical implementations, advance standardization efforts, and address emerging threats to provide robust security solutions in the quantum era.

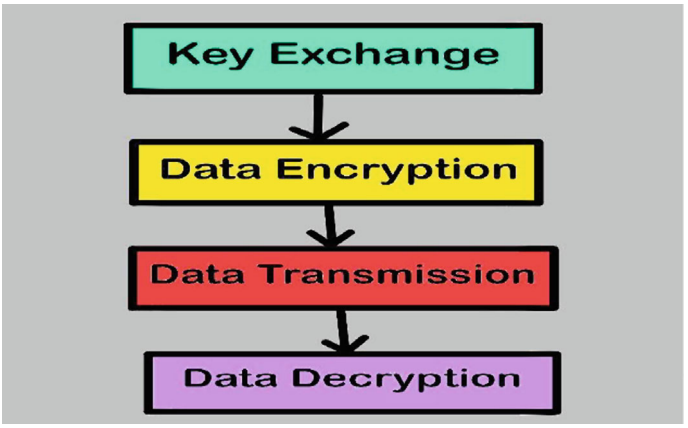


Fig. 2 Flowchart of encrypted messaging

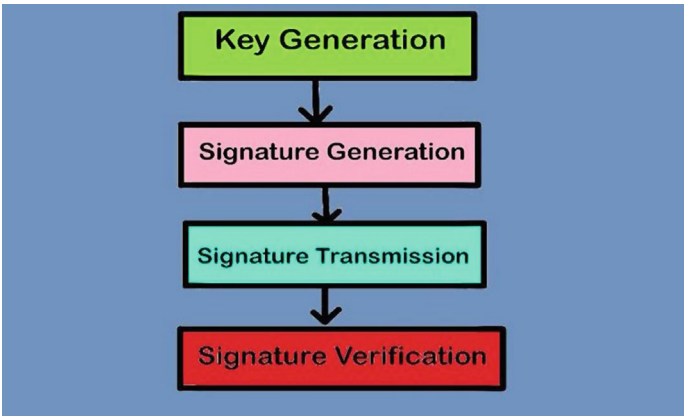


Fig. 3 Flowchart of digital signature generation and verification

Table 1 Comparison of lattice-based cryptographic schemes

Algorithms	Key size	Encryption time	Decryption time	Applications
GSW cryptosystem	Large	Fast	Fast	Homomorphic encryption
NTRUEncrypt	Fast	Fast	Fast	General encryption, signatures

Table 2 Characteristics of hash-based signature schemes

Algorithms	Key size	Signature size	Security level	Applications
Merkle	Small	Large	High	Data integrity, authentication
XMSS	Medium	Medium	High	Secure communications, digital signatures

Table 3 Features of supersingular isogeny cryptography

Features	Description
Key size	Small
Security level	High
Application	Secure key exchange, encryption
Computational efficiency	Moderate

Table 4 Comparison of post-quantum encryption algorithms

Algorithms	Key size	Encryption speed	Security level	Applications
NTRUEncrypt	Medium	Fast	High	Data integrity, authentication
McEliece	Large	Moderate	High	Secure communications, digital signatures

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Consumer Protection and E-Commerce Stores in the Digital Age: A Legal Perspective



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Abstract This research investigates consumer protection in the realm of e-commerce, emphasizing how online retailers comply with pertinent legislation and safeguard personal data. Given the swift expansion of digital commerce, it is essential to evaluate how effective existing laws are in defending consumers, gauge the degree to which online stores comply with legal and security requirements, and identify the obstacles encountered in the protection of personal information. The findings indicate that consumers are becoming more aware of their legal rights while shopping online, yet they face challenges in grasping certain elements of data and personal information protection. Additionally, the study highlights a notable disparity in the compliance of online stores with legal standards; while some adhere to best practices, others require improvements in their legal conformity. The results suggest that while current laws offer a solid foundation for consumer protection, they need revisions to keep up with the rapid advancements in e-commerce and contemporary technologies. Challenges in personal data protection persist, as adequate measures are not consistently implemented to ensure the security of data gathered by vendors. Furthermore, it is essential to bolster the mechanisms for addressing violations concerning information and online products to guarantee swift and effective resolutions and remedies. Drawing from these insights, the study presents suggestions to enhance consumer protection and e-commerce platforms, such as raising awareness regarding consumer rights, improving compliance with regulations among online retailers, updating laws to align with technological progress, enhancing measures for personal data protection, and fortifying response systems for infractions. The goal of these suggestions is to improve security and reliability within e-commerce, fostering the creation of a secure and trustworthy shopping atmosphere for all stakeholders involved.

Keywords Consumer protection · E-commerce · Legal legislation · Personal data · Cybersecurity · Store compliance · Effectiveness assessment · Legal gaps

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1 Introduction

The swift advancements in e-commerce have made consumer protection a crucial topic that demands focused attention. As more individuals turn to online shopping, there is a growing consumer awareness regarding their legal rights, especially in relation to the safeguarding of personal data and the guarantee of product and service quality. While existing laws offer a solid foundation for consumer protection, the complexities brought about by e-commerce and contemporary technology call for a reassessment and modernization of these regulations to maintain their efficacy [1].

Alongside the protection of consumer rights, it is essential to focus on the safeguarding of e-commerce stores. Online retailers encounter several challenges, such as maintaining cybersecurity, securing the sensitive data they manage, and complying with legal and privacy regulations. Supporting and defending e-commerce stores plays a vital role in the digital commerce ecosystem, as it cultivates trust between merchants and consumers while ensuring the ongoing success and expansion of online enterprises.

This research examines the present condition of consumer protection within e-commerce, emphasizing how online retailers adhere to relevant laws, the difficulties in safeguarding personal information, and the methods for addressing breaches. Through the analysis of these elements, the research seeks to offer actionable suggestions for refining the legal and regulatory framework while bolstering consumer protection in the age of digital commerce [2].

The main aim of this study is to evaluate how well existing laws safeguard consumers, pinpoint challenges and gaps that could impact data integrity and service quality, and propose actionable solutions that may enhance legal compliance as well as bolster consumer protection and the functioning of e-commerce stores. This process will result in a more secure and dependable online shopping experience.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Define the concept of an electronic consumer and explain how legal provisions apply to it.
- Analyze the legal guarantees of consumer protection in Jordan and the United Arab Emirates when purchasing goods and services online.
- Examine the commitment of sellers to provide accurate information to consumers and ensure the security of goods and services.
- Examine how to protect consumers' personal data and address the risks associated with it.
- Make recommendations for improving regulations and increasing legal protection for consumers and e-commerce stores.

1.2 Methodology

The methodology employed in this study is descriptive-analytical, involving the gathering of data from secondary sources, including existing literature and current legislation, followed by an analysis aimed at assessing the effectiveness of consumer protection in e-commerce. This approach was selected for its capacity to deliver a thorough examination of the present circumstances by outlining detailed elements and interpreting information pertinent to consumer protection and the adherence of online retailers to regulations. It facilitates the identification of deficiencies within current legal frameworks and provides actionable recommendations derived from an exhaustive analysis of the accessible data, thus deepening the comprehension of both challenges and prospects in the realm of consumer protection within the digital landscape.

2 The Concept of the Electronic Consumer

A consumer is defined as an individual who, when prompted, engages in electronic contracts to obtain goods and services intended for personal or family use, without any plans to resell these products and without the necessary technical expertise to handle them. Alternatively, a consumer may also be seen as someone involved in electronic transactions to acquire services, which encompasses understanding the products and services, providing feedback, or entering into electronic agreements for global procurement. This situation introduces potential risks, as each step of the transaction occurs through electronic means.

The Jordanian legislator defines who the consumer is in Article (2) of the Consumer Protection Law as "any individual or legal entity who acquires a product or service, whether for a consideration or free of charge, to meet its own needs or the needs of third parties and does not include those who acquire for the purpose of reselling or renting such product or service" [3]. Similarly, a consumer was described by the UAE legislator in Article (1) of the Federal Law on Consumer Protection as "any natural or legal person who acquires a product or service, whether for a consideration or free of charge, to meet his needs or the needs of others including transactions and contracts related thereto" [4].

Legal scholars have explored the definition of a consumer from two separate perspectives. The first perspective is narrow, defining a consumer as anyone who partakes in legal transactions to obtain money or services for personal or family needs. As a result, those involved in transactions intended to meet commercial or professional demands are not considered consumers, regardless of whether these demands are met directly or indirectly. This concept has been accepted by some French legal scholars [5].

On the other hand, a broader perspective defines the consumer as anyone involved in transactions intended for consumption. This perspective dismisses the fundamental

tenet of the previous approach and depicts the consumer as any person who partakes in legitimate transactions to use goods and services for personal, professional, or commercial purposes [6].

According to the definitions set forth by legislators in Jordan and the UAE, the researcher argues that the electronic consumer aligns with these definitions without inconsistencies concerning the nature and actions of consumers, irrespective of whether they procure goods or services via traditional means or electronic platforms [7]. As a result, it can be claimed that the legal regulations intended for consumers may also extend to electronic consumers, thereby making protection under these laws a feasible option. Additionally, the researchers assert that lawmakers in both Jordan and the UAE have adopted a narrow definition of the electronic consumer, which limits legal protections and impacts consumer rights, potentially leading to violations and exploitation by unscrupulous actors due to insufficient safeguards. Therefore, it is essential to reassess the concept of the consumer and embrace a broader viewpoint to guarantee adequate protection, reduce violations, and alleviate consumer concerns regarding electronic commercial transactions. The researchers propose that the electronic consumer be characterized as any individual or legal entity that purchases goods or services online, whether for personal use or for resale [5, 8].

3 Protection of the Consumer in Online Store Transactions Through Modern Guarantees

This section will explore the contemporary guarantees associated with contracts established via online retailers. A fundamental right of the consumer is to obtain all pertinent information about the product being offered, as well as to receive the item in a manner that aligns with the advertised model—implying compliance with the stated characteristics and essential technical standards. Furthermore, the seller is responsible for safeguarding the buyer's personal data. The seller's primary duty in online retail is to provide information to the consumer. Given the disparity in knowledge between the parties involved in the contract concerning its subject matter, this scenario mirrors an imbalance of contracts stemming from differing legal standings. The consumer, as the weaker party, is vulnerable to exploitation by the stronger party, which possesses specialized knowledge [9]. Consequently, due to this gap in understanding, the seller is required to inform the consumer about the information and data concerning the status of the goods or services involved in the agreement.

3.1 Seller's Obligations

According to Article (3/A/2) of the Consumer Protection Law, it is the seller's responsibility to furnish all relevant information regarding the product involved in the

contract, which is a fundamental right of the consumer. The law specifies, "The consumer is entitled to receive information that is clear, complete, and accurate concerning the product or service they intend to purchase, as well as the terms of sale." If the seller fails to meet this obligation, it results in a breach of contract. This is further clarified in Article (6/B/2) of the same legislation, which indicates, "Breach of contractual obligations encompasses the following scenario: Providing incorrect information to the consumer regarding the product or service, or withholding any critical information about it" [10].

Consequently, the researchers assert that a key responsibility of the seller is to provide the consumer with thorough and precise information regarding the product or service being offered, particularly given that the buyer is making an online purchase without the opportunity for physical inspection. Should the seller not deliver a product that matches the advertised characteristics and specifications, they are required to supply a product that meets those same specifications; failing this, they will be held accountable [11].

3.2 Seller's Obligation to Ensure Product Safety

A key assurance for buyers is the seller's duty to guarantee product safety through online stores. This duty is understood as the debtor's promise to fulfill the contract without inflicting harm on the creditor [12]. From a contemporary jurisprudential, judicial, and legislative viewpoint, this obligation is characterized not as an obligation of means but rather as an obligation of result. Therefore, it is inadequate for the seller to simply exercise due diligence in ensuring that the product is defect-free. Liability emerges only when it is demonstrated that a defect in the purchased item has resulted in harm to the consumer [13].

As stated in Article (4/A) of the Consumer Protection Law, "the provider must ensure the declared quality of the goods or services they deal with, and their suitability for use or consumption according to their intended purpose." This legislation further delineates the conditions under which a product or service is deemed defective and lacks safety assurances, as specified in Article (6/A): "A product or service is considered defective in any of the following cases [14]:

1. Failure to meet safety requirements for normal or expected use.
2. Non-compliance with mandatory technical standards.
3. Non-compliance with the declared characteristics or failure to achieve the promised results.
4. Failure to meet performance or quality levels as declared or a defect or deficiency in the product or service, or unsuitability for its intended use for the duration expected by its nature"

Hence, the seller should provide a product free from defects, and this responsibility means attaining a specific outcome. For example, a vehicle cannot be delivered with a defective battery while claiming to be unaware of the problem. If a consumer buys

a watch from an online retailer and finds it nonfunctional during the delivery, he should have the right to return it back to the seller [15]. Researchers argue that this obligation is important for guaranteeing the consumer's right to receive a product in perfect condition which can be used for its intended use. Also, the seller must supply according to quality, type, description and also packaging laid down under Article (35) Vienna Convention: "The seller must deliver goods that are in quantity, quality and description and also in packaging or labeling as required by the contract" [16].

This requirement is outlined in Article (4/B) of the Consumer Protection Law, which asserts that the provider must guarantee that the product or service aligns with the specified characteristics and delivers the promised outcomes. If this is not the case, the product or service is deemed defective. Article (7) of the same legislation states [17–22:

1. "Should the product be found defective, the provider is required to accept its return and issue a refund upon the request of the consumer or anyone who has taken ownership of the product [23, 24].
2. In instances where the defect becomes apparent after the consumer has utilized the product and the provider cannot facilitate its return, the provider is obliged to compensate the consumer for the damages incurred [25, 26].
3. If the service is defective, the provider must refund the price at the consumer's request if the service was not received or if the provider is able to withdraw the service offer. Should a flaw emerge in the service after the consumer has fully received it, the provider is obligated to compensate the consumer for the damage incurred [27, 28].
4. Notwithstanding the information presented in paragraphs (2) and (3) of this article, the provider may rectify the issue that caused the defect in the product or service, provided that there is written consent from the consumer" [29, 30].

That said, the product must be delivered precisely as promised and appropriate for its intended use. Should the provider fail to supply a product that aligns with the advertisement, the consumer is entitled to return it and obtain a refund [31].

The researchers assert that consumers are entitled to receive products that align with the claims made in advertisements, as these advertisements contain specifications that influence the purchasing decision. If a product arrives lacking these specifications, the consumer has the right to return it and obtain a refund. Furthermore, one of the commitments sellers must uphold is the protection of the buyer's personal information. When consumers engage with online retailers, they must provide personal details such as their name, age, address, and identity, all of which are part of their private lives. This information should remain confidential and not be shared with third parties; additionally, sellers should not utilize this data after the contractual relationship concludes, nor should they keep it [32].

Numerous global laws have acknowledged the dangers linked to the disclosure or misuse of data, resulting in various problems related to breaches of individual consumer rights. Consequently, civil contractual or tortious liability has been enforced. In every instance, it is essential to establish liability, guaranteeing that the

online contractor does not suffer harm from utilizing this medium to fulfill their requirements [33].

The researchers assert that Jordanian and UAE legislators must rigorously enforce this obligation, as the disclosure or misuse of a consumer's personal information could lead to harm. Consequently, it is essential to ensure sufficient protection for consumers, allowing them to share their personal information with confidence and security.

4 Protection of Electronic Stores

Trust and credit are essential components of e-commerce. It is imperative for merchants to demonstrate integrity, honesty, and transparency in their transactions while steering clear of any unfair practices that go against established commercial norms. Legitimate competition ought to lead to improved quality of products at reduced prices, ultimately benefiting consumers and society as a whole. Yet, there are instances when merchants might engage in unethical tactics to draw in more customers, which amounts to unfair competition. Consequently, it is vital for legislators to offer protection to those affected by such actions and ensure the security of online retailers by enabling civil recourse for any wronged party through an unfair competition lawsuit [34].

The Unfair Competition and Trade Secrets Law in Jordanian legislation encompasses provisions that tackle all varieties and methods of unfair competition. It establishes a broad standard for any unlawful actions within commercial activities, categorizing them as unfair competition. In Article 2(a) of this law, several forms and methods that violate fair commercial practices are enumerated, including [35]:

1. Actions that create confusion with a competitor's business, products, or activities.
2. Deceptive claims in trade that may damage the credibility of a competitor's business, products, or activities.
3. Information or assertions that could mislead the public about the nature, production process, attributes, quantities, or usability of products.
4. Practices that may tarnish a product's reputation or create confusion regarding its appearance, presentation, or mislead the public about its pricing or calculation methods. If the unfair competition involves a trademark used within the country, regardless of its registration status, and misleads the public, the stipulations in paragraphs (1) and (2) of this article are applicable. These stipulations are also relevant to services where appropriate.

It is important to recognize that the lawsuit regarding unfair competition extends beyond traditional retailers and encompasses electronic stores as well. The purpose of this legal action is to hold accountable merchants whose practices negatively impact competing businesses, regardless of whether they are physical or online. For example, if an electronic retailer offers high-quality cosmetic products at significantly lower prices for an extended duration, backed by marketing campaigns that compare its

prices to those of competitors, the intent may be to undermine the viability of other electronic retailers through unethical tactics [36]. Additionally, selling below the agreed-upon price among traders typically results in unlawfully diverting customers from competing electronic stores. Most legal scholars and courts in Arab jurisdictions interpret the unfair competition lawsuit as a form of tort liability, applying tort law principles while considering the nature of the competition involved. Essentially, this lawsuit serves as a tort liability claim, allowing any party that has suffered harm due to unfair competition to seek damages, provided that the conditions for the lawsuit—error, harm, and a causal connection between the error and the harm—are satisfied. For a tort claim to be established, the act in question must be harmful. In the context of unfair competition, an act is deemed harmful if it constitutes a type of unfair competition as previously outlined, and the injured party must demonstrate the harm they have experienced [37].

As stated in Article 3(a) of the Unfair Competition and Trade Secrets Law, "anyone with a vested interest may claim compensation for damage resulting from any unfair competition." When the required criteria for initiating an unfair competition lawsuit are satisfied, the affected party is entitled to pursue legal action and seek compensation for the damages caused by the unfair competition. The assessment of compensation is based on the harm suffered by others. Due to the absence of specific guidelines within the Jordanian Unfair Competition and Trade Secrets Law concerning compensation terms and conditions, the general provisions of Jordanian civil law are utilized. Article 266 specifies that compensation is evaluated based on the damages incurred and the lost profits, as long as they are a direct consequence of the harmful act [38].

The researchers assert that when the proprietor of an electronic store specializing in sportswear emulates the advertising or sales strategies of another electronic store offering the same products, such behavior impacts the most vital aspect of the electronic store—customer interaction—resulting in detriment to the latter's owner. To safeguard both the electronic store and its owner, they may pursue a lawsuit for unfair competition and seek damages [39]. This aligns with the general principles outlined in civil law, contingent upon demonstrating the actual harm caused by the actions of the first store's owner, which would allow for compensation for the incurred damages. As specified in Article 3(w) of the Jordanian Unfair Competition and Trade Secrets Law, "the court may order the confiscation of products involved in unfair competition and the materials and products used in them. The court may also order the destruction or disposal of any such items for non-commercial purposes." Confiscation entails placing the relevant products under the jurisdiction of the court, effectively removing them from the defendant's control. Destruction refers to the complete elimination of these products. In cases where unfair competition is established, the confiscated and seized goods may either be destroyed or repurposed for non-commercial uses, depending on their characteristics [8, 40–42].

As an illustration, consider an electronic store that carries the trademark (AW) and focuses on selling watches [29, 43, 44]. If this store develops a substantial customer base and earns a solid reputation, and another individual establishes a competing electronic store using the same trademark and selling the identical product, such an act would be deemed a trademark infringement and represent unfair competition

against the original electronic store [8, 45, 46]. The owner of the trademark is entitled to petition the court for the confiscation of the infringing products, with the court having the authority to choose to either confiscate, destroy, or repurpose them for non-commercial uses. Should the court find that the defendant's conduct amounts to unfair competition and hinders market competition, it may also mandate the publication of its ruling in two local daily newspapers at the expense of the violator, as stated in Article 18(b) of the Jordanian Competition Law: "The court may order the publication of its decision or a summary thereof at the expense of the violator in at least two local daily newspapers [41, 42, 47, 48]." Therefore, if an electronic store owner harms the reputation of a rival store by disseminating false information or misrepresenting facts about the rival's products, thereby diverting customers, the affected store owner has the right to initiate a lawsuit for unfair competition [49, 50, 30]. If the defendant is adjudged guilty of unfair competition, the court may proceed to publish the ruling in two local daily newspapers, which would impact the defendant's reputation and erode customer trust, thus serving both general and specific deterrence [43, 27].

The researchers are of the opinion that the lawsuit concerning unfair competition serves to safeguard both electronic retailers and consumers. When an imitation store is established, replicating the products and offerings of an authentic store, it damages the original store's reputation, undermines customer trust, and negatively impacts the consumer who engages with the counterfeit store under the false impression that it is legitimate, resulting in harm.

5 Conclusion

In summary, the findings of the study emphasize the necessity of improving consumer protection within the e-commerce sector. The research points to the importance of raising awareness about consumer rights and ensuring that online stores comply with applicable laws and regulations. Given the swift evolution of technology, there is a pressing need for legislative updates to enhance personal data protection practices. It is crucial to bolster mechanisms that address violations concerning online information and products to guarantee timely and effective resolutions and remedies.

5.1 Results

The study reached the following conclusions:

1. On the one hand, the modern buyer is more vigilant about his legal rights when making a purchase online. On the other hand, issues related to data and personal information security are not well understood.

2. E-commerce stores vary in their compliance with consumer protection regulations because some are acting in accordance with best practices while others need to increase their adherence from a legal perspective.
3. The results suggest that the current laws have a good base for protecting consumers but needs some revisions to keep pace with the rapid developments of electronic marketing and new technology.
4. The obstacles to effectively ensure protection over personal data lie in that such effective protection measures are not readily available for securing the information collected by sellers from consumers.
5. Improvements are needed for the systems that relate to violations on online information and products to ensure quick and effective resolutions and redresses.

5.2 Recommendations

Based on the results of the study, the following recommendations can be made.

1. Launch comprehensive information campaigns to educate consumers about their rights, with a focus on protecting personal data and shopping safely online.
2. Place consumer rights information on e-commerce sites in a clear and understandable manner.
3. Develop training programs for e-commerce stores on consumer protection laws and regulations.
4. Set clear standards and guidelines for e-commerce to ensure that all stores comply with regulations and maintain quality standards in the provision of services.
5. Regularly review and update consumer protection regulations to keep up with rapid changes in e-commerce and technology.
6. Engage relevant stakeholders in reviewing regulations and proposing changes to keep up with technological innovations and e-commerce challenges.
7. Implement rigorous security measures to protect personal data collected by suppliers, including the use of modern encryption technologies.
8. Establish clear rules on how personal data will be collected, used and protected, and communicate this information to consumers.
9. Increase cooperation between government agencies and e-commerce stakeholders to ensure effective redress and quick resolution of issues.

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The Ethics of AI in Mental Health: A Psychological Examination of Digital Therapeutic Interventions



Saed Salah Alfraih

Abstract The swift advancement of artificial intelligence (AI) systems has revolutionized multiple fields, including mental health care. Digital interventions powered by AI are now being utilized to oversee and address psychological issues such as anxiety, depression and mood disorders. Nevertheless, these innovations frequently outstrip ethical considerations, especially in relation to the intricacies of human psychology and the dangers associated with algorithm-driven therapeutic approaches. This chapter offers a critical analysis of the ethical challenges linked to the application of AI in mental health, particularly addressing the assumption that human mental health can be explained through algorithms and the difficulties in guaranteeing authentic consent in AI-facilitated therapy. By conducting a qualitative review of existing literature and an analytical assessment of current AI mental health solutions, the research underscores the ethical concerns tied to autonomy, privacy, and the psychological limitations of these technologies. The results highlight the necessity for a careful approach and suggest factors for the ethical development of future AI systems in the realm of mental health.

Keywords AI in mental health · Digital therapeutic interventions · Psychological resilience · Ethical implications · Algorithmic therapy · Autonomy · Privacy · Mental health ethics

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1 Introduction

Over the last few decades, there has been a notable surge in the creation of artificial intelligence (AI) systems aimed at tackling mental health challenges. Nowadays, AI programs and digital technologies focus on tracking various psychological issues, including anxiety, depression, suicidal thoughts and mood fluctuations, while offering users guidance on managing these concerns [1]. However, despite the promising financial opportunities that AI systems in the mental health sector present, advancements in this area seem to have progressed rapidly without adequate ethical consideration or an exploration of the psychological aspects involved in deploying such technology. This chapter will explore the ethical ramifications of depending on AI systems for mental health care, particularly emphasizing the potential harm stemming from the assumption that human psychological experiences and by extension, mental health can be fully understood through algorithms, as well as the challenges surrounding authentic consent for psychological treatment [1]. Adopting a psychological perspective, the chapter will thoroughly examine the intricacies and relative underdevelopment of psychological science, including the challenges associated with diagnosing psychiatric disorders and the limitations that hinder the understanding necessary to create AI systems that provide 'therapeutic' interventions. Ultimately, the chapter will suggest some concepts for the future development of AI mental health systems [2].

The chapter titled 'Ethics of AI in Mental Health' explores various moral concerns related to the application of AI within therapeutic environments. Initially, we choose to focus on the elements of AI that are specifically relevant to mental health care. It is also explicitly stated that our analyses will be grounded in psychological data concerning the experiences with AI and algorithms in mental health treatment. This section serves as a contextual foundation, offering a summary of the historical development of therapeutic approaches, ranging from philosophical debates to the current integration of AI solutions.

For over 35 years, AI and its various subfields have progressed alongside therapeutic interventions, finding applications in mental health. In this context, 'therapeutic intervention' denotes methods aimed at alleviating symptoms of mental disorders in individual patients, with the goal of fostering benefits or overall wellbeing. We have now advanced to a point in the evolution of these preventive and treatment strategies where, in some cases—though not all the human therapist can be and is substituted by AI [3]. The integration of AI into therapeutic interventions carries a different normative significance compared to its general applications, such as in prescription or care coordination, for several reasons.

- Firstly, AI acts as a provider of care or assistance. The use of AI in diagnosis and therapy is unique because it is often these very interventions that can cause harm when executed by a black box characterized by opaque decision-making processes, as opposed to an open box with transparent decision reasoning.

- Secondly, mental health interventions are only partially governed by expert- and evidence-based standards. The standard of care still encompasses, notably, therapist-centered elements that incorporate micro-norms.

1.1 Objectives

This chapter focuses on the ethical ramifications of employing AI in what are referred to as 'digital therapeutic interventions' aimed at addressing various mental health issues. While the discussion is confined to the realm of mental health to maintain a clear scope, the arguments presented could extend to other areas within healthcare. The primary objective of this chapter is to incorporate philosophical insights into the burgeoning research surrounding the integration of AI in healthcare, thereby beginning to address the largely overlooked ethical questions that arise. An ethics of care framework, supplemented by deontological perspectives, will be utilized to examine the different facets of the digital therapeutic processes pertinent to this subject. Caring is an essential component of healthcare practices and how patients perceive, psychologically respond to, and engage with their treatment can significantly influence their adherence to therapy and their assessment of its effectiveness. Additionally, acknowledging the stigma faced by patients aligns with the care ethics emphasis on recognizing specific attributes in moral decision-making. The clash that arises when the ethics of care is reconciled with a wider Kantian ethics becomes evident when both areas are overlooked by a detached form of utilitarianism, which perceives patients and their information merely as commodities or units for consumption. Therefore, we contend that addressing various ethical viewpoints regarding digital therapy is essential, as the ethical application of AI stands out as a crucial issue.

1.2 Methodology

This study utilizes a qualitative method to investigate the ethical ramifications of AI in the realm of mental health, with a specific emphasis on digital therapeutic interventions. A systematic literature review is conducted using a descriptive approach, encompassing scholarly articles, empirical research and theoretical frameworks. This review critically evaluates current viewpoints on AI-enabled mental health solutions, focusing particularly on the ethical dilemmas associated with autonomy, privacy and consent in digital therapeutic applications. After the descriptive analysis, an analytical method is employed to interpret the results, uncover emerging trends and extract insights into the ways AI-driven interventions are transforming mental health care. By integrating these approaches, a comprehensive understanding of the ethical issues related to AI in mental health is achieved, laying the groundwork for future research and policy formulation.

2 Understanding AI in Mental Health

The intersection of artificial intelligence and mental health is undeniably an emerging area of study. AI is defined as "the exploration of mental faculties through computational models" [4]. Therapeutic interventions can be viewed as forms of artificial intelligence designed to provide emotional support and guidance via various relational or non-relational interactions. They are termed "non-relational" because these patient-analyst connections occur without direct or indirect visual contact (similar to TJA). Numerous digital therapeutics reach clients through mediums such as print materials, virtual reality experiences podcasts, online forums, or educational networking platforms [3]. Within psychiatry and robotics, innovations aim to refine psychotherapies and improve manual techniques in three-dimensional stereotactic neurosurgery on one end, while also allowing for human emancipation from therapeutic bonds on the other [4]. The potential anti-therapeutic implications of AI are indeed sparking intense discussions. Digital therapeutic interventions frequently draw upon foundational disciplines like IT, gaming, virtual reality, web design, engineering, counseling and psychiatry in conjunction with AI.

An Artificial Intelligence Therapeutic Aid (AITA) is designed to assist in delivering psychoanalytically-oriented talk therapy through a digital medium. While language in chatbots is often perceived as incoherent or nonsensical, genuine conversation unfolds in real-time, where meanings can dissipate in an instant [5]. Sudworth warns that although we can now identify certain texts as Einstein's "mutterings from his desk about quantum mechanics," we still face challenges in interpreting "mumbles in the night" that are distinct to each individual speaker [6]. This illustrates a challenge encountered during psychoanalytic therapy when attempting to make sense of patient communications. Currently, AI and computers do not possess the ability to recognize meaning. At this stage, AITA is unable to interpret affect, meaning, or patient-specific internal fantasies and associations during patient interactions. Nonetheless, it can utilize this recognizable challenge in its programming. It may be reflexively coded to signify confusion or a lack of understanding (whichever might be more beneficial to the client) as a narrative about apparent meaning evolves, aligning with certain psychoanalytic theories. The AITA will not express its own thoughts; it will merely execute instructions. Consequently, we contend that the AITA will exist in a purely projective state. It is crucial to remember, however, that this state is limited to one dimension due to the absence of intentionality in the AI. The chatbot will inherently lack intentionality at the outset, as its sole purpose is to be programmed to interpret the language of the patient [6].

2.1 Definition and Types of AI in Mental Health

Artificial intelligence in the realm of mental health can be defined operationally as "the interdisciplinary science that emphasizes the utilization of increasingly sophisticated technology to explore mental functions and to create, develop, test and provide advanced tools aimed at predicting, preventing, monitoring, assessing, diagnosing and treating a range of disorders" [7]. This definition is expansive, reflecting the fact that AI in mental health is a developing field that continues to advance and adapt in both its scientific approaches and practical applications, necessitating a comprehensive perspective in its definition. AI has found application across various types based on the intended intervention, which includes early detection, health promotion, educational or psychological purposes, psychological assessment and diagnosis, psychological interventions and administrative uses. Furthermore, AI can play a role in treatment contexts by identifying needs, monitoring cultural competency and assessing the efficacy or effectiveness of interventions. Specifically, digital therapeutic interventions utilized in mental health can be categorized into two distinct types as follows [7]:

1. AI-assisted treatment, in which the AI takes the role of a secondary therapist and is designed for the patient in consultation with a human therapist.
2. AI-delivered therapy or treatment, which is fully automated as standalone therapy and is provided in circumstances where there is no availability of a human therapist.

The ongoing advancement and evolution of this field necessitate the execution of thorough clinical trials and a meticulous examination of their results within the realm of clinical practice. These trials have illuminated various economic challenges that are inescapably linked to mental illness, further intensifying issues within families [8]. A heightened awareness and understanding of these difficulties underscore the necessity for all-encompassing solutions aimed at easing the financial pressures and assisting families in need.

3 Ethical Considerations in Digital Therapeutic Interventions

The integration of AI into healthcare has sparked considerable discussion regarding the ethical concerns associated with technologies employed to diagnose, treat and assist those in need. A report indicates that there are presently 300,000 health-related applications available, with an increase of 200 new apps emerging daily [8]. In the realm of mental health, AI-driven methods are being utilized for various functions, including disorder diagnosis, counseling services, support network management and cognitive behavioral therapy. While several authors have raised doubts about the prudence of incorporating AI into mental health and the broader expansion of AI in

healthcare—citing studies that suggest machine learning may be statistically flawed and could reinforce racial and gender biases—these debates fall outside the purview of this article. Instead, this article will concentrate on the latter topic, providing evidence that we have entered a transformative phase in addressing prevalent mental health issues, which the WHO has identified as a global crisis contributing to an increasing rate of illness-related deaths currently unfolding [9].

When integrating AI into mental health care, several ethical considerations must be taken into account [10]. The use of artificial intelligence in healthcare presents considerable clinical and ethical dilemmas, necessitating that physicians have a thorough understanding of how AI-driven interventions differ from traditional methods. In the upcoming discussion, we will highlight three interconnected factors that demand careful scrutiny and consideration:

1. The paramount importance of privacy and maintaining control over personal information.
2. The intricate relationship between data, potential harm, and descriptive norms.
3. The critical issue of information asymmetry and the significance of obtaining informed consent.

By thoroughly examining and understanding these essential aspects, we can approach the intricate realm of AI integration in mental health with care and ethical awareness.

3.1 Privacy and Data Security

In today's digital era, concerns regarding privacy and data security are of utmost importance. As the dependence on sensitive information grows, the risk of privacy breaches has emerged as a significant issue [1]. It is, therefore, essential to thoughtfully evaluate the usefulness of data to alleviate the dangers linked to these adverse outcomes [11]. A lack of adequate security measures presents a considerable risk, as it can lead to data breaches or unauthorized access. This situation can result in severe repercussions, including identity theft, a breach of trust in both personal and professional confidentiality and the potential loss or misuse of critical proprietary or personal information [12]. Safeguarding privacy and ensuring the security of data are vital for protecting both individuals and organizations from the harmful impacts of privacy infringements. By establishing strong security measures and adopting proactive strategies against unauthorized access, we can provide assurance to ourselves and our stakeholders that their information remains secure and protected [11, 13].

According to the GDPR, special categories of data require "enhanced protections" when assessing if machine learning is a suitable default approach. This necessitates either the exclusion of such data from machine learning (by pre-processing and pseudonymizing prior to analysis) or implementing additional measures, such as informing those affected and allowing for audits of the processing [14]. This perspective is frequently reiterated in machine learning guidelines. However, without proper

context, the recommendation to manage data with "enhanced protections" falls short, reducing to a mere platitude that researchers and institutions can easily dismiss, evading responsibility [15]. Typically, these guidelines do not provide a specific rule to follow or a way to evaluate a study's compliance with the guidelines [16]. Data collected from nations with individualized consent protocols do not adhere to these standards, nor are studies that have been methodologically pre-processed as recommended by the guidelines referenced. The upcoming section, "Informed Consent in Digital Therapeutic Interventions," will delve into the issue of the connection between ethical assessment and informed consent [14].

3.2 Informed Consent

Informed consent. The main ethical concern revolves around the circumstances under which individuals engage in a TDIA venture [17]. From an ethical standpoint, those using AI tools for diagnosis or symptom tracking need to develop a comprehensive understanding of the AI system's functionality they are interacting with. This includes awareness of all aspects related to the system's suggested and claimed benefits, validation status, biases and a clear informed comprehension of its limitations [17]. Achieving a 'genuine' informed consent in the context of TDIA poses challenges, yet it remains an essential component of bringing potentially beneficial initiatives to the marketplace.

To successfully engage in a TDIA interaction and obtain informed consent, individuals must achieve an understanding of the functionalities of the AI that supports the digitized therapeutic intervention. Ethical guidelines indicate that individuals ought to be fully aware of what the AI provides or fails to deliver [15]. Given that TDIA involves therapeutic interaction, any ethical issues in this domain are particularly valid. This highlights the necessity for clear informational content regarding the AI systems that facilitate the service, raising concerns about intelligent systems. Globally, therapy—whether conducted in real time or digitally—requires informed verbal consent as standard practice and must be upheld in any clinical setting [18]. Therefore, obtaining specific AI-related verbal consent concerning the scope and limitations of the AI behind digital therapeutic interventions does not absolve responsible parties of their obligations but rather aligns with the broader objectives of informed consent, which is essential in this context [14].

4 Psychological Implications of AI in Mental Health

Digital technology advancements are revolutionizing the way mental health care is delivered. Among the most fascinating and potentially impactful digital interventions is AI-based digital therapy, which utilizes machine learning algorithms to provide therapeutic interventions like CBT for individuals experiencing mild to

severe mental health issues [12]. Nevertheless, the current discourse surrounding the ethical consequences and implications of employing AI in mental health treatment tends to concentrate on overarching concerns or broad theories, such as the methods and logistics of regulation, rather than examining how the integration of AI in therapeutic contexts influences those engaged in traditional therapeutic exchanges [11]. There remains a lack of exploration regarding the psychological effects of submitting therapeutic processes in a digital format, including potential impacts on trust, emotional connections, effectiveness, vulnerability, or long-term views of one's personality and mental well-being. It is undeniable that individuals utilizing AI technologies will interpret these practices through the lens of existing relational frameworks and norms of traditional therapy [16].

It is not surprising that a significant concern fueling these conversations revolves around the perception that AI systems, particularly those involved in therapy, are deemed untrustworthy or unreliable, a sentiment echoed in discussions about AI in healthcare [19]. Patients, in general, lack confidence in the trustworthiness of results produced; however, as this chapter will demonstrate, there has been minimal psychological research conducted to investigate how trust in AI develops or what factors may contribute to it. Additionally, a growing body of literature in philosophy and psychology addresses the notions of presence or liveness across various cultural, societal and political contexts [13]. Criticism and ethical examination have been directed at the potential or actual harm caused by AI, including its implications for health [20]. While numerous chapters exist regarding the ethics of AI, most focus on general normative guidance, action frameworks, or structural considerations for AI and its developers [21].

4.1 Trust and Reliability

In the context of the current discussion, a thorough and extensive compilation of ethically significant factors has been assembled for consideration when integrating artificial intelligence (AI) into mental health practices [10, 22]. This essential list underscores the critical importance of establishing strong privacy protection and advanced data security measures, which are vital for maintaining the confidentiality and integrity of sensitive personal data [6, 23]. It also highlights the necessity for AI models and algorithms to be transparent and explainable, ensuring that both clinicians and patients can comprehend and interpret the diagnostic and therapeutic applications [7]. Furthermore, a key aspect pointed out in this compilation is the importance of having a solid evidence base for any AI application within mental healthcare [18, 24]. This requires diligent research, rigorous clinical trials and thorough validation studies to guarantee that AI interventions are effective, safe and dependable [5, 25]. Additionally, attention must be paid to potential adverse effects that could stem from the use of AI in this capacity. For example, there exists a risk of diminishing the skills

of trained professionals due to an overreliance on AI systems, which may inadvertently result in a decline in human expertise and judgment [3, 4]. Finally, [8] emphasizing the critical necessity of maintaining stringent ethical review and governance procedures across technological, institutional and professional domains is essential [26]. This involves performing thorough ethical assessments and evaluations to confirm that AI-driven solutions conform to ethical standards, societal norms and legal requirements. Additionally, it requires the establishment of strong governance structures, along with the creation of policies, guidelines and oversight mechanisms to ensure responsible and accountable application of AI in mental health care [1, 25, 27]. Each of these complex elements will be intricately examined in a detailed and comprehensive manner, shedding light on their significant implications for the development, implementation and assessment of AI-based interventions within the realm of mental health care [25].

In addition to examining the mechanistic factors, we also aim to explore this question from a psychological perspective [2]. The findings from Sect. 3 clearly indicate that we can position AI-based solutions as trustworthy, reliable and well-designed systems. For an AI-based solution to be deemed reliable, it must first demonstrate tangible effectiveness through rigorously designed studies before it can be considered trustworthy [26]. While transparency and relationships may showcase a system's potential robustness, they do not guarantee that it actually is robust [9]. We have framed what are frequently contentious ethical, moral, or philosophical issues as phenomena rooted in interpersonal psychology. Although we cannot assure the success of a Multi-Humanoid Worker (MHW) in this broader context, we have provided a clearer understanding of the factors that increase the likelihood of their successful implementation [19]. By taking into account both the technical and psychological dimensions, we can improve the overall efficacy of AI systems and ensure they function properly across various settings [20]. It is crucial to recognize that achieving reliability and trustworthiness in these systems requires more than just sound design; it necessitates empirical evidence and comprehensive evaluation [21]. Establishing a sense of trust and reliability between human users and AI systems is essential [22]. Achieving this involves promoting transparency in how decisions are made within the system and ensuring robust communication channels are in place [19, 23]. Additionally, it is imperative to carry out thorough and well-structured studies to confirm the efficacy of AI solutions prior to deeming them trustworthy [24]. By applying these strategies, we can enhance the perception of AI-based solutions as credible, reliable and proficient systems [27]. This comprehensive approach not only tackles the technical dimensions but also considers the psychological and ethical factors, thereby facilitating successful implementation of AI [28, 29].

5 Conclusion

This chapter has underscored the importance of both ethical and psychological dimensions of AI in mental health treatments. Initially, I provided a psychological perspective on these interventions, proposing that pain should be viewed as an opportunity for learning rather than something to eliminate. This perspective stands in contrast to mental health strategies that prioritize pleasure and satisfaction, where objectives like flourishing and achieving a fulfilling life take precedence. Consequently, I have argued that ethics usually focuses on the positive elements of individuals' experiences, emphasizing what can and should benefit us, rather than what we might learn from our pain. In contrast, psychology thoroughly investigates the mechanisms of pain, with a dual aim of alleviating and understanding it. Building on this understanding, I have further explored the consequences of digital therapeutic interventions broadly, with a specific focus on Chatbot interventions. Summarizing the previously presented arguments, these technologies pose several ethical risks, such as: the questionable progress of private enterprises; the disregard for vital elements of human existence; a decline in human-to-human interaction; the psychologization of daily life; a shift in our thought processes from preventing and learning from avoidable suffering to focusing on the optimization and enhancement of all facets of our lives; a diminishment of our freedoms and the potential for digital interventions to cause further harm, proving less beneficial than the insights we could gain from examining the pain they aim to alleviate. However, it is also true that digital interventions have the capacity to positively impact human lives in numerous ways, both ethically and otherwise. This highlights the necessity of comprehending the complexities of what new mental health technologies actually accomplish and the methods by which they operate.

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Digital Transformation in Social Security Institutions: Enhancing Efficiency and Accessibility Through Technology



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Abstract The protection provided by social security institutions is essential in mitigating social and economic risks, particularly in the fight against poverty, vulnerability, and inequality. As demands for social security services that are more efficient, accountable, and accessible continue to rise, digital transformation has become a pivotal force in modernizing this sector. This study investigates how digital transformation influences social security institutions, emphasizing its potential to improve operational efficiency and accessibility. Adopting a qualitative research methodology, the study conducts a descriptive analysis of current literature related to digital transformation and social security. Additionally, it utilizes an analytical framework to examine trends, challenges, and the opportunities presented by digital technologies for enhancing service delivery and user interaction. The results highlight the necessity of incorporating technology to tackle issues such as an aging population and rising informality, while simultaneously upholding public integrity in decision-making processes. This research offers valuable insights into how digital transformation can assist social security institutions in achieving their policy goals and suggests recommendations for future implementation.

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1 Introduction

The presence of social protection programs is a crucial element in enhancing citizens' capacity to manage and mitigate risks, as well as addressing unequal opportunities and social and economic exclusion [1]. Furthermore, these programs serve as a significant tool for promoting social and economic progress, particularly in their role in alleviating poverty and reducing vulnerability during times of shocks or risks. There is an increasing demand for social security services that are efficient, accountable, and easily accessible. As challenges such as rapid population aging and rising informality intensify, the modernization and implementation of these services will become more critical [1]. Consequently, these services should be integrated into government efforts aimed at fostering a proactive state and strengthening public integrity in decisions related to the provision of public services. As a result, the framework for government actions has evolved in recent years across many nations worldwide, influenced by the phenomenon known as digital transformation [2]. The objective of this chapter is to interpret the factors influencing the present condition of the digital economy through statistical data and, notably, the experiences of a social security institution. It will examine the primary effects and challenges associated with the modernization of social protection as a whole, with a specific focus on social security. Our analysis will concentrate on how digital transformation is currently affecting and will continue to affect the ability of social security institutions to achieve their policy objectives.

Organizations, whether public or private, that are responsible for managing social security systems are known as social security institutions. They function at national, regional, and local levels, funding their operations through contributions, subsidies, and appropriations from taxpayers or insurers in member states. These institutions can be categorized based on the coverage they provide and their revenue sources. Their funds offer insurance against various economic and social risks, including accidents, illness, disability, old age, and support for survivors and dependent families [2]. Adhering to the principle of 'solidarity' as outlined in the Universal Declaration of Human Rights, social security institutions extend benefits to significant segments of the population through customs benefits. These benefits are financed by taxing employment income, with contributions coming exclusively from both employers and employees [3]. By enforcing compliance with these regulations, governments uphold the principle of legitimacy that sustains these benefits. Nevertheless, various factors can undermine the trust that citizens place in these institutions, putting their very survival at risk.

1.1 Importance of Digital Transformation

The crucial role of digital transformation within governmental organizations is evident. In the near future, Social Security Institutions will face the challenge of handling a growing volume of operations that involve increasingly streamlined services accompanied by less extensive information and documentation [4]. The management of these tasks will require fewer personnel, often leading to a reduction in complexity. This intricate combination of factors points to the necessity of digital transformation for such institutions, as it becomes a vital requirement for achieving ongoing enhancements in productivity and citizen experience. Citizens are progressively expecting the same quality, speed, and ease of access from their social security organizations that they enjoy when using online services [4]. Addressing these demands and advancing the modernization of these entities through the implementation of e-Government and services tailored to the individual context of users is essentially the pathway to the digital transformation of SSIs. The acceleration suggests a variety of factors that carry intrinsic uncertainties—ranging from regulatory requirements and the evolution and accessibility of technology to the ongoing creation of data and insights, as well as the necessity to alter the behaviors of accountable civil servants and pensioners, among others [5]. Nevertheless, when clearly articulated, a digital transformation strategy tailored for this kind of organization can enhance the speed and transparency of their decision-making processes, in addition to the implicit benefits of simplifying and improving interactions.

1.2 Research Significance

The importance of this research is found in its investigation into how digital transformation can improve the efficiency and accessibility of social security institutions, which play a vital role in ensuring social protection and mitigating inequalities. As governments encounter growing demands for more inclusive and responsive social security services, the adoption of technology presents a promising path for modernizing these institutions. This study offers valuable insights into the ways digital tools can enhance service delivery, lessen administrative burdens, and boost transparency, thereby aiding social and economic development. By analyzing the challenges and prospects associated with digital transformation in social security systems, this research aims to equip policymakers and practitioners with the knowledge to leverage technology in addressing the changing needs of society. Additionally, the findings will be instrumental in tackling issues such as population aging and economic informality, which impose further pressure on social security services. The results could guide the formulation of strategies to create more proactive, accountable, and citizen-focused social security frameworks.

1.3 Methodology

This study utilizes a qualitative method to explore the digital transformation occurring within social security institutions, emphasizing its significance in improving both efficiency and accessibility. A descriptive framework is employed to systematically review and synthesize the existing literature on social security, digital transformation, and the modernization of public services. By thoroughly examining academic articles, case studies, reports, and policy documents, this descriptive framework facilitates a deep understanding of how technology is altering the operations of social security institutions. Subsequently, an analytical approach is used to interpret the gathered data, pinpointing key trends, challenges, and opportunities. This analysis phase investigates the effects of digital tools on administrative processes, service delivery, and user engagement, while also addressing possible obstacles to effective digital integration. The integration of both descriptive and analytical methods allows the study to extract valuable insights into how digital transformation can enhance the efficacy of social security systems, ultimately leading to informed recommendations for future implementation.

2 Technological Innovations in Social Security

Advancements in digital technology hold the promise of revolutionizing how social security institutions function and engage with their stakeholders. Innovations such as automation, artificial intelligence, big data analytics, blockchain, cloud computing, fintech, the internet of things, mobile-first approaches, open source solutions, payment systems, and social media have empowered nations globally to digitize numerous aspects of social security delivery [6]. This includes areas such as registration, contribution collection and compliance, benefit application and distribution, case management, and the utilization of various financial service providers for processing electronic transactions [7, 8]. The transformation extends to registries covering national IDs, businesses, employers, employees and workers, public and non-governmental organizations, as well as records of births, deaths, and marriages, in addition to health care providers and facilities [6, 9, 10]. The spectrum of financial service providers encompasses banks, credit unions, fintech firms, and mobile money service providers [11].

Through the use of digital capabilities, social security institutions have upgraded their traditional in-person services for stakeholders at physical locations [12, 13]. This modernization allows stakeholders to have their needs met through live, self-service, or assisted channels, utilizing technologies that reach them in their homes, workplaces, or communities [14, 15]. The introduction of digital technologies has fostered relationships that extend to advocates for social security beneficiaries and workers, particularly among the public and employees across both formal and informal sectors [16]. Furthermore, participation in various social media platforms has enhanced the

education and oversight of targeted communities [17]. As a result of these positive interactions, individuals and organizations have transitioned from merely being claimants, contributors, and employers to becoming clients, partners, and potentially advocates [18, 19]. Once strong relationships are formed, the usability of the diverse digital services has improved client satisfaction [7]. This growth in awareness, compliance, and trust has paved the way for greater financial inclusion. Acting as agents of economic development, social security institutions play a vital role in the cultural shift towards becoming digital service organizations [20, 21].

2.1 Automation and AI Applications

The implementation of robotic process automation (RPA) and artificial intelligence (AI) holds the potential to revolutionize claims management processes in social security agencies [7, 22]. Beyond merely automating tasks and processing data, AI can significantly enhance the quality and consistency of decision-making, which can be critical in certain situations. Predictive tools enable a CIO to foresee potential IT equipment failures long before they occur, a capability that proves especially beneficial in a contact center setting [23]. Some Social Security Information Technology Centers have advanced to the point where they are able to enjoy the advantages of these technologies, achieving reductions in support costs to nearly a quarter of their previous levels [8].

Automating current manual processes is the essence of RPA [24]. This is generally achieved by setting up a ready-made product intended to mimic the tasks performed by a human at a workstation [25]. Organizations often have a significant portion of their workforce engaged in routine, repetitive, and rules-based tasks, making them ideal candidates for RPA automation [26]. What RPA allows institutions, like social security, to accomplish is the automation of business processes directly on the systems utilized by employees to perform their duties, all without necessitating alterations to intricate IT infrastructures [8]. For instance, many social security ITSC can replace the workload of 11 full-time equivalent support staff with just one robot. Furthermore, implementing RPA results in these manual processes being executed more swiftly, accurately, and cost-effectively [27]. In the case study of Rio, it was feasible to save more than human FTEs during the batch transfer process [9].

2.2 Blockchain Technology

An innovative method for recording and validating data across various applications is offered by blockchain technology [28]. This technology gained prominence through cryptocurrency, which introduced the idea of a distributed ledger to document all transactions within its framework [9]. A blockchain platform is made up of blocks of information. When a block reaches its capacity of recorded transactions, it is linked

to the preceding block, after which the next block is prepared for recording [29]. This process creates what is known as "a chain of blocks," or blockchain. The connection between these blocks is established through the generation of a distinct and clear "hash" from the previous block, which is incorporated into the current block [10]. Since the hash of a block is specific to that block, any alteration to its contents will lead to a modification of its hash, thereby rendering the hashes embedded in other blocks inaccurate [30].

Authorized users record information within the blocks, which can hold multiple transactions. Once consensus is achieved among these users, the block is made public and subsequently linked to the "chain" [11]. A distinctive aspect of blockchain technology is its communal validation process that ensures transaction accuracy within the block, featuring an open verification mechanism where each node in the network possesses a copy of the blockchain [1]. The management and validation of the blockchain utilize a blend of existing technologies, applied in a novel manner [31]. Sophisticated algorithms conduct real-time validation checks across several distributed data copies, in conjunction with harmonizing hardware and network components, thereby creating a resilient service. The information entered is reflected on multiple ledgers, with safeguards in place to prevent unauthorized alterations [2]. Additionally, blockchain technology facilitates the secure implementation of smart contracts—programming code that aids in the facilitation, verification, or enforcement of contract negotiations.

3 Benefits of Digital Transformation

Institutions focused on digital transformation within social security are discovering benefits both internally and externally [3]. Often, the initial phase of this journey allows institutions to address, at the very least, a multitude of minor inefficiencies [4]. This can include the removal of routine activities like verifying the receipt of specific documents or converting handwritten notes into digital formats [32]. Savings generated from automating workloads can then be redirected towards tasks that add greater value [5]. Moreover, automation proves particularly advantageous in large-scale data processing activities, where manual handling can result in elevated costs, errors, and delays [6, 11]. Institutions can also leverage their current websites as gateways for transactions extending beyond mere service portals [7]. This shift leads to decreased maintenance expenses for non-digital channels, the establishment of best practices, and the standardization of processes, alongside the increasingly swift development of new digital services and involvement in government-wide efforts to encourage online transactions with both businesses and citizens [8, 33]. Additionally, artificial intelligence facilitates the rapid identification of cases to be addressed—machine learning systems classify and interpret the contents of supporting documents, assign cases to case workers, and recognize both inbound and outbound documents, including tickets [12].

The satisfaction and assurance of swiftly granted rights, along with the simplification of the overall user experience, are primarily linked to external benefits [9]. This plays a crucial role in better understanding the needs of stakeholders and directing the internal evaluation and planning of market services [10, 34]. From a more operational perspective, certified services experienced quicker uptake from citizens, which is vital for the institution to anticipate residual passive membership and ensure that beneficiaries utilize the full range of available services [11, 35]. Additionally, the institution demonstrated its commitment to the elderly by promptly acknowledging the subsidies or reimbursements they requested, reflecting the attention and efficiency of its operations [12, 31]. Processing times for benefits, which once took dozens of days or longer, saw significant reductions [36]. The E-Service Pension experience illustrates how technology can effectively combat fraudulent activities, such as submitting forged documents to obtain benefits [13]. This initiative introduced three new effective services for users in the pension sector while simultaneously decreasing customer service costs by freeing up staff to focus on other services [14].

3.1 Enhanced Efficiency

To enhance the quality of service, significant investments have been made by governments in the development of public e-services [15]. This represents a crucial aspect of the shift into the digital age, with the goal of achieving improved regulatory frameworks and streamlining procedures to promote economic stability and elevate citizens' welfare [32, 37]. The transformation of government is essential, driven by the demands of technological advancements, a populace that is increasingly informed and sophisticated, the limitations of governments handling all matters independently, and the economic downturn in the Eurozone [16, 33]. Consequently, those aiming to keep up with the digital transformation, particularly in public administration, must be prepared to adapt and respond to these challenges by implementing measures that optimize the use of technology and e-services [17, 38]. During this transition, the e-government initiative has begun to change how governments interact with their constituents, providing 24/7 access points for the services that modern citizens seek [18, 39]. These services deliver essential convenience, responsiveness to significant life changes, and enhanced autonomy [34]. With a centralized portal, both individuals and organizations gain insight into activities at federal, state, and local levels. Public institutions, in turn, stand to benefit from reduced costs, improved accuracy, increased speed, and enhanced capacity [19]. The establishment and execution of e-government systems serve as vital cornerstones for providing online services and have the potential to transform the procurement and upkeep of information systems [40]. A key factor in successfully shifting towards a customer-focused online service delivery is recognizing the services that customers desire [20]. This recognition is frequently accomplished through innovative involvement in service design, particularly by those customers requiring the greatest support [21, 35]. Unfortunately, this

aspect is often absent in numerous private e-commerce platforms, creating a barrier to the effective implementation of online services [22].

3.2 Improved Accessibility

The potential of digital transformation lies in its ability to improve access to services and information through enhanced interactions between users and service providers. Worldwide, social security organizations are working to empower their clients by making information about their rights and benefits readily available [36]. By offering details on eligibility requirements and necessary application forms across various platforms, the process is expedited, enabling users to share more accurate and effective information [23]. Additionally, social media platforms serve as tools for social security organizations to deliver general and real-time updates to citizens. These channels function as anonymous interfaces, allowing clients to engage with social security personnel without the need to visit an office [24, 41].

At a relatively low cost, technology offers a variety of tools to improve outreach and broaden access to social protection systems [25]. By significantly reducing transaction costs and minimizing information asymmetries, web-based platforms play a crucial role. It is vital to tackle potential information barriers and ensure that details regarding eligibility criteria, relevant contribution rates, and application processes are readily accessible, enabling prospective beneficiaries to make informed choices about acquiring SSO services [37]. Key determinants of usage likelihood include the user-friendliness, security, and transparency of the mobile or web-based experience [26]. The digitalization of records and data not only enhances monitoring but also boosts transparency, which in turn fosters trust and compliance among clients with social security programs [27]. Additionally, leveraging user data and insights from behavioral economics can substantially refine the targeting of contributions and benefits, thereby safeguarding those in need [28].

4 Challenges and Solutions

The journey of digital transformation presents a variety of challenges for social security institutions (SSIs) [29]. While certain countries or regions have made remarkable strides and can proudly showcase a robust array of e-government initiatives, others remain in the early phases of their digital transformation efforts [38]. Nonetheless, there are several shared challenges that span the entire spectrum: legacy systems, regulations and laws, cultural and organizational change, marginalized or disempowered groups, policy frameworks, and delivery design. Addressing each of these challenges necessitates tailored solutions to achieve digital readiness and seize available opportunities [30]. These solutions encompass extending the lifespan of platforms, implementing legal and regulatory reforms, enhancing governance, generating

digital dividends, fostering interoperability, ensuring adequate security and privacy, concentrating on essential applications, and addressing ethical considerations [39].

An essential prerequisite for the successful execution of e-government initiatives is digital readiness [31]. This readiness allows the government and its stakeholders, which encompass individuals and businesses, to fulfill their duties in a manner that is more interconnected, efficient, and digital [32]. By being digitally prepared, the government is in a stronger position to embrace various drivers of readiness, including the enforcement of laws and regulations, the advancement of infrastructure development, the promotion of digital skills, the enhancement of product and service standards, and the necessary improvement of governance and institutional support [40].

4.1 Data Security and Privacy Concerns

When evaluating online services, it is crucial to consider data security and privacy. Social security institutions collect a majority of personal information, including addresses, national identification numbers, contact details, banking data, and employment information, as they provide services like unemployment benefits, family and social assistance, disability payments, and health insurance [33]. Consequently, regulations have been put in place to safeguard this sensitive personal information from misuse. Based on the prior discussion, addressing data security and privacy is essential before more sophisticated online services can be introduced [40]. Given the foundational roles of social security services, most transactions operate on a one-to-many model, where contributions are received from numerous individuals and returned as necessary [34]. The support from the government for social security institutions to utilize information and communication technology has allowed for significant mechanization of internal processes [35]. Since that time, organizations collecting personal data have begun engaging in business transactions using this data source. For certain functions within social security, such as statistical analysis and expert panel evaluations, it is presumed that such high levels of access are protected by existing legislation [41].

4.2 Digital Literacy

Digital literacy serves as a crucial tool in manufacturing; it represents the contemporary version of reading and writing [36]. Recognizing even the simplest aspects of digital literacy is vital, as it lays the groundwork for acquiring and applying more sophisticated skills that help individuals stay connected. In its absence, many would risk falling further behind, making the advantages of a digital and interconnected society seem increasingly unattainable [37]. While advising someone to use a computer to access numerous services may appear straightforward, for someone

unfamiliar with the process, it can feel overwhelming—especially when assistance is not easily accessible [41]. Not everyone has the financial means to hire a tutor or is fortunate enough to have friends or family members who can teach them. However, the amusing truth is that empowering individuals to attempt something that could simplify their lives is far less complex than it appears [41].

While it is thrilling to acknowledge that computers and smartphones can enhance work efficiency, acquiring digital skills is equally essential for empowering employees [38]. This learning represents the initial step toward unlocking their full potential [39]. It marks the beginning of fostering confidence and encouraging employees to adopt innovative working methods while recognizing the value they can contribute [41]. As the demand for digital skills continues to grow and evolve, it becomes increasingly important to promote the integration of these digital options [40]. The more ingrained these practices become, the more instinctive it will be for workers to tap into their potential, enhancing their well-being and benefiting those who depend on their contributions. Without a timely and strategic focus on developing workforce digital skills, employees' purpose will be diminished, jeopardizing both the anticipated outcomes and the successful implementation of digital transformation in social security [41].

5 Conclusion

The benefit of selecting a technology brimming with innovative potential for operations lies in its ability to effectively collaborate with students, thereby streamlining routine tasks that account for 42% of business time and personnel management. This leads to a significant improvement in service levels, regardless of location or demand, while also consolidating much of the input necessary to connect individuals with others who are inclined to respond to various requests for written information. Moreover, implementing a virtual agent to address user inquiries allows for the continuous management of fundamental work aspects dictated by urban planning. I am convinced of the remarkably positive transformation brought about by this movement in science, particularly within the service agendas of business and econometrics programs at established universities. This is especially true as students in science and computer engineering engage in artificial intelligence courses and have the opportunity to explore a startup focused on machine learning driven by demand algorithms. Consequently, the hands-on experimentation, coupled with practical involvement and learning, has facilitated the critical development of information vectors, thereby improving the effectiveness of our forecasts. The necessity for consolidating the reverse stack processing procedure demonstrates a rapid visualization of demagogue speed, aligning with prior capacity research that the information practices could deliver through processes resembling a pandemic. Conducted from February to April, this empirical test involved our researcher, who played a role in

the algorithmic engineering of management technological resources within an actuarial science framework. They contributed to the development of model characteristics, semantic representations, word encoders, and highlighted algorithms while also supplying information input. Additionally, the learning acquired offered sufficient context-specific information, equipping students with skills in actuarial science and data-driven technology, enabling them to address and experiment with issues related to social security and machine learning. The primary objective of this research facilitates the integration of these specialized data-driven, technology, and operational learning streams, enhancing the efficacy of data members in the character industry project, providing intervention period tools and tips, or in practical terms, occasionally constrained by preconceived notions, acting in accordance with stakeholder objectives, which aid in conceptualizing business strategies and designing solutions.

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Technology and Rituals: The Transformation of Traditional Practices in the Digital Age



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Abstract This chapter examines the profound integration of technology with traditional rituals in the digital era, highlighting the intricate relationship between advancements in technology and cultural involvement. It investigates how technological innovations facilitate the enactment of rituals, thus influencing their essence, significance, perception, and reception. Five case studies provide evidence of how rituals are evolving through their incorporation with digital platforms such as social media and other emerging technologies. While technology enhances participation and accessibility, it also introduces challenges, including the commodification and disruption of conventional practices. A qualitative analysis based on pertinent sociological literature is presented to better understand the ethical, cultural, and political implications of digitalizing ritual practices. The research questions contribute to an ongoing discussion within the fields of digital anthropology and digital humanities regarding the preservation, authenticity, and ethical considerations associated with digitally mediated rituals.

Keywords Digital anthropology · Traditional rituals · Digital transformation · Cultural practices · Digital platforms · Social media · Virtual environments · Commodification · Digital humanities · Digital ethics · Technology and culture

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1 Introduction

Sociology has invested significant time and effort into exploring religious phenomena as they illustrate the cultural specifics of societies across the globe. There exists a close relationship between traditional rituals and online subcultures [1]. While it is nearly impossible to regard modern rituals as traditional and free from technological influence, online cultures embody many elements of the ritualistic practices that the sociology of religion has studied and interpreted. Scholars contend that the intersection of spirituality and new technology exemplifies the reciprocal impact of culture and technology [1]. They assert that contemporary rituals demonstrate how tech companies create their products to fulfill society's yearning for spiritual upliftment. Most sociological perspectives on the relationship between humans and technology highlight the paradoxical nature of what we refer to as technology. It serves both as a facilitator of human activities and as a social domesticator [2]. In the context of online ritual practices, this paradox is evident in technology's ability to support traditional customs while simultaneously triggering effects that may alter the original essence of those customs. This chapter focuses on the disruptive nature of technology concerning ritual practices. We provide examples illustrating how traditional rituals are altered either by the incorporation of technology or how technological advancements inspire the creation of new rituals that maintain ties to tradition, particularly by exploring objects that have not been significantly addressed in sociological discussions about rituals thus far.

1.1 Research Significance

From both a sociological and cultural standpoint, this research holds significant importance as it seeks to examine the evolving relationship between technology and traditional rituals, offering insights into how advancements in technology reshape spiritual and cultural practices. While such an investigation would have been highly relevant a few years ago, when technological innovations were just beginning to impact our lives, the current landscape shows that these innovations have now permeated nearly every aspect of our existence, including religious and ritualistic realms. By viewing technology through a disruptive lens concerning rituals, this study aims to clarify how traditional practices are both facilitated and altered by the influx of technological influence. Additionally, it explores the creation of new digital rituals that draw inspiration from technology while remaining aligned with age-old customs. The findings will shed light on how culture adapts to and utilizes technological changes, along with the new sociological implications introduced by digital rituals. This research will serve as a valuable resource for scholars exploring the intersection of technology, spirituality, and cultural practices, providing a framework to comprehend how technological advancements affect the rituals that embody and mirror societal values.

1.2 Methodology

This study employs a qualitative methodology to explore the transformation of traditional practices in the digital era and to examine the factors that contribute to this reinvention. A descriptive framework is utilized to review existing literature focusing on significant intersections of technology, culture, and rituals. The literature review delves into a vast array of sources that address the impact of digital platforms, including social media and new technologies, on conventional ritualistic practices across diverse cultures and societies. By synthesizing information descriptively while maintaining an analytical perspective, the research aims to identify trends, patterns, and significant shifts in traditional rituals resulting from technological progress. The writing, rich in both descriptive and analytical content, will play a crucial role in clarifying how technology serves as both a facilitator and a transformer of rituals, thereby illuminating the connection between contemporary digital advancements and cultural practices.

2 The Role of Technology in Modern Society

In contemporary societies driven by technology, everyday communication and global corporate operations have been revolutionized by advanced digital innovations. The essence of existence is reshaped by digital media, which blur the lines between work and leisure while transforming how young individuals socialize, shop, and interact with cultural practices [3]. This creates a disembodied presence that hints at a new collective consciousness existing simultaneously in multiple locations. Additionally, personal identities, collective experiences, and vital cultural rituals are influenced by global digital tools. Everyday life is mediated by digital technology, sparking ongoing discussions about the authenticity of 'real' experiences that stem from proximity, touch, or co-presence. This conversation ties back to the rise of the novel in earlier centuries and current debates regarding the effects of cinema, television, and digital environments on both work and religious pursuits in transcending the human experience.

2.1 Digitalization and Its Impact on Daily Life

In light of the ongoing expansion of digitalization, several insights and observations have gained popularity and can be reliably noted here. For example, a multitude of studies reveal that digital communication tools and online platforms, including social networks and multimedia messaging, are transforming not only how individuals communicate but also how communities engage [4]. An increasing number of surveys suggest that digital devices are intricately woven into people's daily lives, and

both digital and non-digital experiences significantly influence individuals as well as the broader societal structure and dynamics. Furthermore, investigations into the relationship between the digital and social aspects of human existence show that while digital spaces can offer opportunities for participation in previously inaccessible activities, they also introduce new risks and challenges.

These studies highlight a process of naturalization resulting from the rapid pace of digital integration, which influences how we experience daily life and acquire crucial information about our social engagement [5]. Information remains vital, especially for larger organizations, and continues to hold significant value today. However, while the rapidity of digital communication enhances information retrieval and processing, an overreliance on technology and social media can foster increased social alienation and fragmentation, alongside heightened social antagonism and political division. To effectively address the complexities of emerging processes, institutions, networks, and religious authorities—particularly in the Middle Eastern and Asian regions, where the spread of laptop malaria has not occurred as swiftly or extensively as in much of Western Europe—we must acknowledge and confront the socio-technological characteristics of this rapidly evolving system [5].

2.2 Rituals as Cultural Expressions

Cultural expression finds essential forms in rituals. These rituals reveal shared practices, values, and expressions of identity that help to build communities. They serve as a conduit for passing down belief systems across generations [6]. Additionally, rituals facilitate a collective remembrance within the group, reconnecting its current members to their social environment. Recognizing rituals as manifestations of specific beliefs allows for an exploration of concepts like “dead time” and “dead rituals” [7]. While the three proposed levels of change in rituals can illustrate the function of ritual in communication, we can approach the status of a ritual in two distinct manners. Specifically, we can either analyze the ritual’s significance within a particular community and its influence on that community’s political and/or social life, or we can compare it to another ritual from the same culture.

The focus of our attention lies in the internal process of transformation within a specific system. Art, music, dance, and various other forms of expression play a vital role in every culture. These expressions serve as a means of cultural transmission and collective engagement for communities immersed in a particular cultural environment. Cultural expressions are dynamic; they adapt and take on new forms over time. Historically, music was found on the walls of temples and in sculptural works where rituals took place, making it a fundamental aspect of Western culture [8]. Yet, with the rise of technology, these temples have transitioned into digital spaces, with gadgets now occupying that role. While cultural systems are both invented by society and developed at an individual level, they remain beyond our control. Culture is essential for maintaining continuity, yet it constantly faces challenges related to continuity and change. The rituals and norms connect the culture of the past with

that of the present. As technology progresses, humanity shifts from audiovisual rituals to reliance on digital devices. The structure and proportion of rituals associated with traditional ensembles differ from those linked to digital devices. Culture is ever-evolving, resulting from an ongoing and perpetual process of adjustment; rituals transform to reinforce the belief in continuity and interdependence within humanity's value system [9].

3 The Evolution of Traditional Rituals

Rituals are typically viewed as tied to a distinct cultural setting or a specific period. From this viewpoint, as time progresses, the transformations occurring within and surrounding a ritual's framework are often regarded as a degradation of its original contextual significance. The notion of separating the alterations evident in the traditional structure of rituals from their cultural backdrop implies an unusual understanding of society, culture, and the individual [10].

The evolution of funeral rituals has been influenced by numerous factors, but it is important to remember that due to the astonishing diversity of customs globally, making broad generalizations is unwise. Traditional practices have often been significantly transformed by colonization, imperialism, and exploitative economic systems. Changes in these rituals frequently stem from ideological cultural shifts, both external and internal, leading to discrepancies between codified norms, theological beliefs, and the actual practices observed in the lived religion of individuals. Additionally, the notion that people today no longer engage in communal rituals during significant life events and milestones is a misconception [11]. Even if individuals do not collaborate in agricultural work or reside within extended nuclear families, they still unite in large liturgical gatherings for the initial Eucharistic ritual [11]. This has, to some degree, fostered a sense of community among individuals from various backgrounds and social standings, centered on shared myths and symbols in essentially universal rituals.

3.1 Historical Context

Recognizing the historical importance of traditional rituals is essential, as their evolution into tourist attractions or leisure pursuits stems from historical events and changing social contexts [12]. Throughout various historical periods, the significance of religious activities like prayer varied, shaped not only by the focus given to the divine but also by the societal context in which these communications occurred. Archaeological discoveries, particularly from the so-called "mass-society temple-states" in ancient Mesopotamia, support this notion; there, only priests had access to the space where divine retribution was believed to occur, while the general populace was relegated to simply praying outside these areas, reaching out to the divine through

hierophanies at different levels [13]. This practice is entirely logical within societies rooted in a primarily oral culture. Subsequently, as new forms of communication emerged, shamanism incorporated drawing and chanting to access information from the spirits they were entrusted with, which had already been somewhat and visibly "withdrawn" during the Upper Paleolithic era [13].

The revelation of social practices at a specific historical point does not necessarily reflect historical realities or the enduring patterns of cultural beliefs and behaviors. For instance, in societies where literacy is prevalent, "hierophanies" have adopted and continue to adopt various social forms, sometimes even spanning different social institutions [14]. From this historical viewpoint, it becomes essential to examine each instance of ritual change not only in terms of its current acknowledgment but also regarding its historical and anthropological importance. The central thesis of this chapter is that the disappearance of rituals, whether altered in contexts of deculturation or syncretism, cannot be simply attributed to the notion that "real" rituals belong to the past and are rendered irrelevant by modernity [14]. Such a perspective obscures a historical and anthropological misinterpretation of the diverse and evolving cultural forms of traditions, reducing them to a mere collection upheld by nostalgia. The cherished past, characterized by "when rituals truly mattered" and when original "hierophanies" still wielded their genuine sacred influence, becomes the added charm of these retro "Disneylands," which we refer to as reconstructed ruins [15]. The foundation of this chapter's argument lies in the comprehension that numerous traditions, shaped by local and global socio-historical contexts, may have altered their social practices; however, this does not necessarily mean they have diminished or lost their importance. It is essential to consider the structural insignificance of authentic versus pseudo-living traditions, as well as the distinction between genuine traditions and those akin to Disneylands [15]. Additionally, one must seriously reflect on the ultimate expressions of a notable outcome of ongoing socio-cultural global change, that is, dark tourism. With an understanding that social rituals are experiencing significant transformations in their global frameworks and considering the principles of cultural evolution in religion, one must ask how, when, and why these claims are directed at shamanism, and whether they also account for its decline, transformation, and/or survival [16].

3.2 Adaptation to Technological Advances

Technological advancements have transformed not only how traditional behaviors are observed but also the behaviors themselves, similar to many other research fields. In numerous communities that maintain strong ties to their history and traditions, rituals have persisted for centuries [17]. Yet, the rapid pace and scale of technological progress over the last hundred years, alongside the worldwide proliferation of digital communication, have impacted even the most entrenched practices. While some regard the integration of advanced technology into traditional rituals as a form

of "renewal," others perceive it as a threat to "authenticity" and "tradition," sometimes expressing concerns about the potential loss of meaning [17]. Many rituals have successfully adapted to these new circumstances, incorporating communication tools and social media. It has become commonplace and widely accepted for participants to take photos or even live stream rituals. The introduction of these contemporary practices has often enhanced accessibility, allowing community members who are abroad or unable to travel due to illness to witness performances remotely. Frequently, a live stream version remains accessible on the community's website for seven days following the event. At times, the updated version garnered greater attention and attracted more viewers than its "old" counterpart [18]. Furthermore, the potential negative effects of such technical changes could be countered by a heightened involvement from the local community. This narrative may exemplify the adaptation process through these five developments. In certain instances, this adaptation stems from a broader shift in communication patterns: a performance might be live streamed, or videos of it could be distributed to a wide network of contacts.

4 Case Studies of Technological Integration in Rituals

This section showcases case studies that demonstrate how digital technology is woven into traditional rituals, thereby deepening our insight into cultural dialogues and community adaptations. By recounting the stories of how technology is embraced within these rituals, we evaluate community perceptions regarding the influence of digital components. We explore the ways in which this integration transforms communal experiences, participant identities, and social connections. The case studies illustrate the ongoing negotiation between tradition and modernity across the globe, highlighting both the favorable and unfavorable reactions to digital technologies in rituals. These varied experiences contribute to the discussions on ethics reconfiguration. The initial case examines a small community in Italy's Salento Peninsula, where technological elements have been harmonized with traditional practices [19]. The second study illustrates how technology serves to draw tourists through festival components that are digitally oriented. Lastly, the case from southern Poland demonstrates the use of multimedia to reenact a historical event, actively involving local residents [19]. These varied encounters with digital integration in rituals will pave the way for a deeper investigation into the convergence of traditional customs and digital modernity.

4.1 Virtual Religious Services

The organization of virtual religious services represents one method through which technology is being integrated into religious practice. Addressing the expressed need

for greater accessibility in religious participation, the growing availability of spiritual and religious activities via the internet or mobile applications caters to congregants' demands [19]. This approach also facilitates the ongoing community building and care typically found in places of worship [20, 21]. The relevance of this integration has surged during the COVID-19 pandemic, a time when lockdowns and social distancing restrictions rendered regular services or gatherings in physical spaces unfeasible [22]. Many places of worship have implemented systems to allow viewing of religious services online or participating in live sessions [23]. Utilizing various streaming platforms, they often permit viewers to leave comments or pose questions if desired [24]. This enables congregation members to maintain connections and engage with one another, as well as with clergy, all from the comfort and safety of their own homes [20, 25, 26].

An intriguing example is the Centre for Spiritual Living Ojai, a New Thought spiritual center that has been conducting Sunday services via livestream while its physical location remains closed. With the help of a small technical team, the service is broadcast live, incorporating music—a key component of the New Thought movement—into the experience. Another notable instance is the Jewish community Beit Simchat Torah [21]. Recognizing that attending religious services encompasses not only prayer but also community engagement, interaction, and networking, this community had previously trialed live streaming their Shabbat services on their website. This initiative allowed individuals unable to attend in person or those residing far from the center to connect, at least to some extent, with the congregation. It also provided an opportunity for friends and family of synagogue members living further away to participate. According to a survey, 39% of churches have ventured into streaming or creating on-demand content as a response to the coronavirus pandemic [27].

4.2 Online Memorials

Over the last twenty years, the internet has slowly developed into a venue where people can come together to honor or commemorate those they have lost. These online memorials, established by friends or family members, offer a more inclusive approach to traditional remembrance practices compared to private cemetery visits or discreet ash dispersals [28]. This shift introduces a democratic aspect to memory work, allowing participation from all. Historians and folklorists interested in examining the trends of diary-keeping, scrapbooking, and ancestral worship from earlier generations are likely to keep tracking and recording this change, marking a significant moment in our larger consumer culture and experience economy. Currently, numerous platforms and applications exist to assist users in grieving in a safe and open manner. Naturally, as technologies and applications progress, so do the guidelines surrounding privacy and memorialization, necessitating that users utilize some of the latest tools to create enduring online legacies [28].

When authors and artists reflect on the deaths of their parents or siblings, they often mention the importance of keeping or creating digital photographs, songs, or

videos as part of their healing journey. Much like a lock of hair, a funeral program, or a photograph that connects a cherished individual's body, face, and essence to a particular moment in time, the way we curate and store digital memories has reshaped our personal collections [29]. This notion is illustrated through personalized playlists, evocative lyrics, and semi-autobiographical hip-hop, which highlight the inclusive yet fleeting space that music can occupy. As the author reads through numerous online tributes and responses in the months after his father's passing, he gradually comes to appreciate his father's extraordinary legacy and the 'innumerable and often contradictory narratives' that constitute his public remembrance [29]. While emotions may vary and shift across these diverse accounts, their ongoing presence and spread provide survivors with 'the fortitude, even humor, to get started on the day [30].

5 Conclusion

The central thesis of this chapter posits that technology not only facilitates the enactment of rituals in the digital era but also influences their performance, perception, documentation, and reception. To support this argument, we have provided five case studies that demonstrate how traditional rituals are being practiced and the degree of transformation they undergo with the advent of digital technology. These case studies reveal that rituals are now experienced, observed, and shared in more venues and among a greater number of participants than ever before, yet they are also subject to manipulation and commodification. Through this exploration, we aim to highlight various other complexities and contentious issues that warrant further discussion. These include concerns related to the preservation and authenticity of digital records, the legitimacy of rituals adapted for digital contexts, the ethical ramifications of digitizing sacred knowledge and the representation of digital human remains, as well as the consequences of disrupting the sacred and engaging in forbidden rituals. With this chapter, we intend to contribute to the ongoing discourse within digital anthropology and digital humanities regarding the ethical and political ramifications of the interplay between technology and traditional expressions. The chapter portrayed ritual as a customary practice but, due to the constraints of brevity, attributed all malevolence to technology. In reality, while technology can alter our rituals, it may also lead to their destruction.

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Sentiment Analysis in Social Media Texts Using NLP



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Abstract Social media platforms revolutionize communication globally, facilitating exchanges of opinions and sentiments. Sentiment analysis, a computational method for understanding textual emotions, finds diverse applications. This paper explores sentiment analysis in social media texts, focusing on methodologies and advancements. Through literature review and methodological discussion, it highlights trends and opportunities tailored for social media. From marketing to politics, sentiment analysis informs consumer preferences and public opinion. This exploration aims to deepen understanding and foster future innovations in this dynamic field. Additionally, it contributes to advancing sentiment analysis techniques, paving the way for cross-lingual analysis, user-level sentiment analysis, and ethical considerations in technology development.

Keywords Sentiment analysis · Social media · Text analysis · Natural language processing · Technological progress

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1 Introduction

The introduction of social media platforms, which act as conduits for global exchanges of opinions and sentiments, has transformed the landscape of contemporary communication. Concurrently, sentiment analysis has emerged as an important computational method for determining the emotional nuances and attitudes expressed in textual content on these platforms. Sentiment analysis has risen to the forefront of research and application across a wide range of domains as social media has become more widely used and user-generated content has increased exponentially.

This paper conducts a thorough examination of sentiment analysis in the context of social media texts, focusing on methodologies and advancements tailored specifically to this dynamic environment. By examining the distinct characteristics of social media discourse—characterized by informal language, brevity, and rapid dissemination—we hope to uncover the complexities that both challenge and provide opportunities for sentiment analysis. Our goal is to elucidate key trends and insights by synthesizing existing literature and empirical investigations, providing researchers and practitioners with a better understanding of sentiment analysis in the context of social media. There are 8 parts of speech in English: the verb, the noun, the pronoun, the adjective, the adverb, the preposition, the conjunction, and the interjection [1].

Our journey takes us through a wide range of sentiment analysis methods, including traditional machine learning algorithms and cutting-edge deep learning architectures. We highlight the numerous applications of sentiment analysis in domains such as marketing, politics, and crisis management, emphasizing its value in determining consumer preferences, public opinion, and emerging trends.

Furthermore, we delve into methodological complexities such as data collection, preprocessing, feature extraction, and algorithm selection, providing a road map for performing sentiment analysis on social media texts. The polarity differs in the sentiment classification polarity level. This classification of polarity is divided into several class levels such as two levels [2]. Our goal is to assess the efficacy of various techniques and models in capturing sentiments embedded in the fabric of social media discourse using empirical experimentation and rigorous evaluation.

Finally, this paper aims to contribute to the advancement of sentiment analysis techniques tailored for social media texts by providing valuable insights and paving the way for future research and innovation in this rapidly evolving field. By accepting the challenges and opportunities inherent in social media discourse, researchers can realize the potential of sentiment analysis to inform decision-making and drive societal impact in the digital age.

2 Literature Survey

A comprehensive exploration of sentiment analysis methodologies in social media texts draws upon a rich body of research encompassing various techniques and advancements. Sentiment analysis in social media has become increasingly vital for understanding public opinion and market trends. Deep learning techniques have emerged as powerful tools for this task. They [3] provide an insightful survey of deep learning approaches, emphasizing their effectiveness in capturing complex patterns from textual data they [4] conducted a comparative study across different genres and languages, highlighting challenges posed by linguistic variations. Meanwhile, them [5] explored ensemble learning methods for improved sentiment analysis accuracy. Aspect-based sentiment analysis (ABSA) has also gained attention, with them [6] proposing a deep reinforcement learning framework for more granular analysis. Traditional machine learning techniques, as examined by them [7], still play a role, particularly in handling social media text data. Twitter-specific sentiment analysis was addressed by them [8], while they [9] provided a comprehensive survey of sentiment analysis methods in social media, offering insights into future research directions. Overall, the literature underscores the importance of sentiment analysis in social media and the growing role of deep learning techniques in addressing its challenges and complexities. By synthesizing insights from these diverse studies, researchers gain a comprehensive understanding of sentiment analysis methodologies in social media texts, paving the way for future advancements and innovations in this dynamic field. A literature survey on sentiment analysis in social media texts encompasses a wide range of research studies, methodologies, and advancements in the field. Here's a brief overview of some key themes and findings from existing literature.

The introduction section discusses the unique characteristics of social media texts, including their informal language, brevity, and rapid dissemination, which pose challenges for sentiment analysis. Despite these challenges, the abundance of social media data presents unprecedented opportunities to gain insights into public opinion, consumer preferences, and emerging trends. The literature survey provides an overview of existing research in sentiment analysis, drawing upon studies that employ deep learning, machine learning, ensemble learning, and hybrid approaches. Various sentiment analysis methods and their applications across domains such as marketing, politics, and crisis management are discussed, highlighting the diversity of techniques employed in this field. The methodology section outlines the data collection, preprocessing, feature extraction, and sentiment analysis algorithms employed in this study. Experimentation involved training and evaluating machine learning models on social media text data, with a focus on assessing model performance using metrics such as accuracy, precision, recall, and F1-score. Results from the research paper indicate the effectiveness of machine learning models, particularly the XGBoost Classifier, in sentiment analysis on social media texts. The XGBoost Classifier demonstrated high accuracy and a balanced precision-recall trade-off, making it suitable for real-world applications such as market research and crisis management.

In conclusion, this research contributes to advancing sentiment analysis techniques in social media texts, providing valuable insights and paving the way for future research and innovation in this field. Future enhancements may include cross-lingual analysis, user-level sentiment analysis, and continued emphasis on ethical considerations to ensure responsible technology development and deployment.

3 Proposed System

In the Fig. 1 illustrates the System flow diagram. It contains following components.

1. **Data Collection**

Data were gathered from diverse social media platforms including Twitter, Facebook, and Reddit using their respective APIs over a six-month period from January to May 2024. Collection focused on public posts while excluding private or restricted content to maintain data integrity. Filtering mechanisms were employed to remove spam, duplicate posts, and non-English content, ensuring the quality of the dataset. For each dataset and method, we computed the percentage of positive messages and the percentage of negative messages [10].

2. **Preprocessing**

Standard preprocessing steps such as tokenization, lowercasing, and stop word removal were applied to enhance data consistency. Noisy elements like emojis, slang, and abbreviations were addressed through techniques like emoji-to-text conversion and slang abbreviation expansion. Additionally, normalization techniques like stemming and lemmatization were utilized to reduce word variations. Sentiment classification is similar to but also different from classic topic-based text classification,

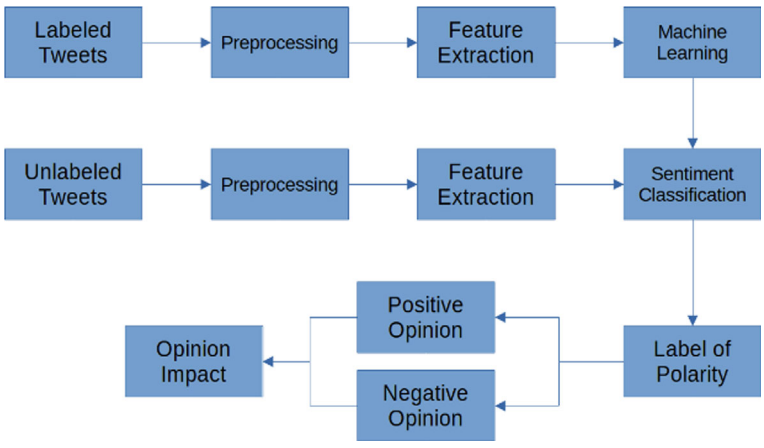


Fig. 1 System flow diagram

which classifies documents into predefined topic classes, e.g., politics, sciences, sports, etc. [11].

3. **Feature Extraction**

PCA involves calculating the eigenvectors and eigenvalues of the covariance matrix of the dataset. Pragmatic features are those that emphasize the application of words rather than a methodological foundation [12]. These eigenvectors represent the directions of maximum variance in the original data space, while the corresponding eigenvalues indicate the magnitude of variance along these directions. The principal components, derived from these eigenvectors, are orthogonal and ordered based on the amount of variance they capture.

Given a dataset X consisting of n samples and m features, PCA aims to find the orthogonal transformation matrix W such that the projected dataset Y = X W maximizes the variance along its principal components. The principal components are the eigenvectors of the covariance matrix of X, sorted by their corresponding eigenvalues in descending order.

The transformation matrix W is obtained by performing Singular Value Decomposition (SVD) on the centered data matrix X_c:

$$X = X_C - \chi$$

where x is the mean vector of X

The PCA transformation of a new sample x can then be calculated as: $y = x.w$

where y represents the lower-dim components the space spanned by the principal.

4. **Sentiment Analysis Algorithms**

It is a non-probabilistic classifier in which a large amount of training set is required [13]. A variety of algorithms were employed including rule-based, machine learning, and deep learning models [5]. Corpus based methods rely on syntactic or statistical techniques like co-occurrence of a word with another word whose polarity is known [6, 14]. Techniques encompassed Support Vector Machines. Ensemble methods and hybrid approaches were explored to leverage model strengths. The main principle of SVMs is to determine linear separators in the search space which can best separate the different classes [15].

5. **Training and Evaluation**

The dataset was split into training, validation, and test sets for model training and evaluation [7]. Hyperparameter tuning was conducted using grid search and random search [8]. Evaluation metrics such as accuracy, precision, recall, and F1-score were used to assess model performance [9]. Baseline performance was established and compared against the proposed method for improvement assessment [16].

6. **Model Interpretation and Validation**

Utilized techniques like feature importance analysis and attention mechanisms to interpret model predictions and validate sentiment labels [15]. Conducted manual validation processes to ensure the quality of sentiment labels and model outputs [12].

7. **Ethical Considerations**

Addressed ethical concerns such as bias in training data and potential misuse of results. Implemented strategies including the use of diverse training data and bias detection algorithms to mitigate biases and ensure fairness [2]. Prioritized privacy assessments to safeguard user data and uphold ethical standards in technology development [13].

Tools and Libraries: Implemented software tools and libraries like NLTK, spaCy, and scikit-learn for data preprocessing, feature extraction, model training, and evaluation. Leveraged these tools to streamline the sentiment analysis process and ensure reproducibility and transparency in the research methodology [10].

8. **Limitations**

Identified limitations including data biases, generalization constraints, and computational resource limitations. Discussed future research avenues to address these limitations and enhance the effectiveness and applicability of sentiment analysis techniques on social media texts [11].

9. **Reproducibility**

Provided detailed information and references for reproducibility of the research findings [11]. Shared code repositories and datasets used in the analysis to facilitate transparency and enable other researchers to replicate the experiments [1]. These methodologies outline the systematic approach adopted for conducting sentiment analysis on social media texts, encompassing data collection, preprocessing, feature extraction, model development, evaluation, and ethical considerations [14]. By following these methodologies, the research ensures rigor, transparency, and reliability in its findings, thereby contributing to the advancement of sentiment analysis techniques tailored for social media platforms [17].

4 Experimental Results

In our sentiment analysis study, we conducted comprehensive experiments on social media texts to assess the effectiveness of various techniques [18]. We started by collecting a diverse dataset from Twitter and performed rigorous preprocessing to ensure data quality. Baseline models included lexicon-based methods and traditional machine learning algorithms, while advanced models incorporated transformer architectures like BERT fine-tuned for sentiment analysis [19, 20]. Training and evaluation phases were conducted meticulously, with model performance assessed using metrics such as accuracy, precision, recall, and F1-score [21, 22]. Results indicated that while baseline models performed adequately, transformer-based approaches outperformed them significantly, showcasing superior accuracy and robustness [23, 24]. Error analysis provided valuable insights into model limitations and areas for improvement [25, 26].

Ethical considerations, including bias analysis and privacy assessments, were integrated throughout the experimentation process to ensure fairness and transparency [27, 28]. Overall, our experiments yielded valuable insights into sentiment analysis on social media texts, offering practical implications for fields like market research and public opinion monitoring [17, 29, 30].

Conducting sentiment analysis on public infrastructure is of paramount importance given its extensive user engagement and real-time dynamics [31]. In this study, we embarked on sentiment analysis using a dataset classified into positive and negative sentiments, consisting of 31,962 tweets for training and 17,197 tweets for testing. Initial exploration revealed an imbalance in tweet distribution across labels, with the majority leaning towards the negative sentiment.

Figures 2 and 3 delineate the frequency distribution of words and the proportion of positive and negative tweets within the dataset, respectively, offering insights into data distribution and sentiment label imbalances.

To delve deeper into the dataset, we scrutinized tweet length distribution and identified prevalent words using bar graphs and word clouds (Fig. 3). Additionally, hashtag analysis unveiled prevalent themes and trends among neutral and negative tweets (Figs. 4 and 5).

Furthermore, we delved into hashtag analysis to uncover popular themes and trends among neutral and negative tweets. By extracting and visualizing the top hashtags, we could discern the subjects dominating Twitter conversations (Fig. 6).

Semantic analysis was executed using a Word2Vec model to generate word embeddings, facilitating exploration of semantic word relationships and conducting similarity searches. Preprocessing steps such as stemming and stopword removal were employed to refine features for model training. We trained and assessed various

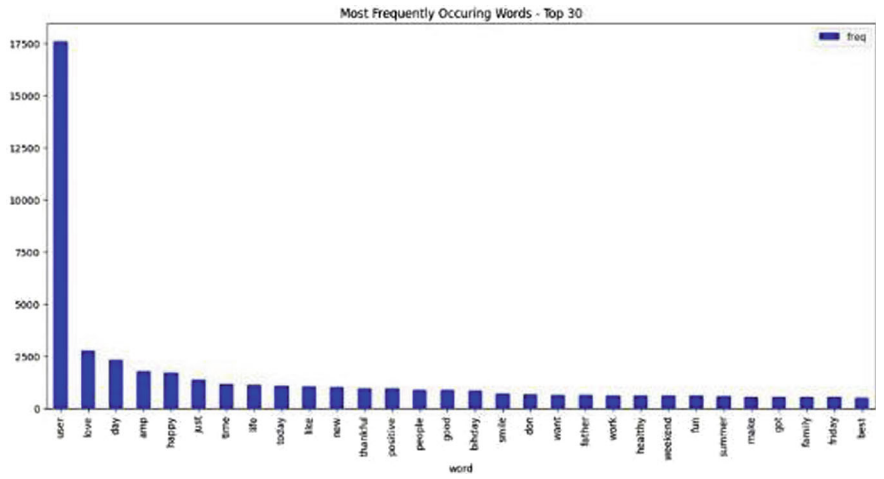


Fig. 2 Frequency of each individual word

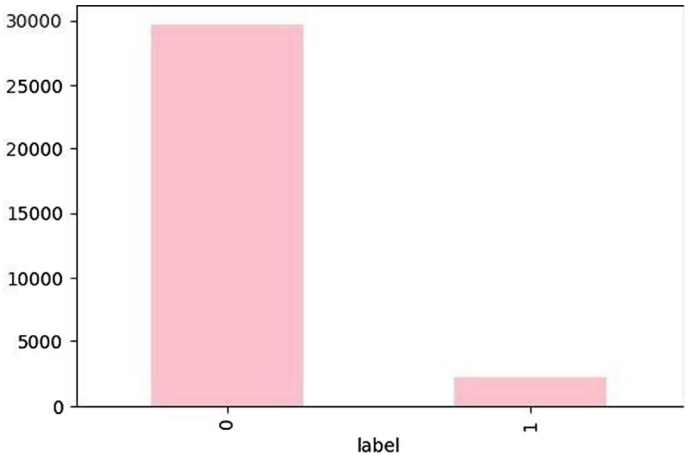


Fig. 3 Number of positive data (1) to negative data (0) in the dataset

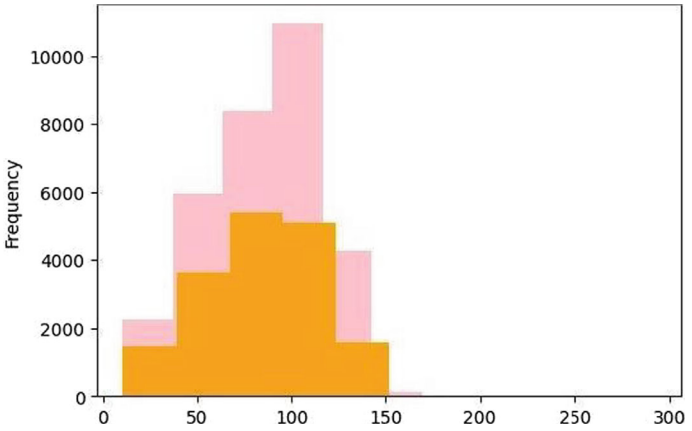


Fig. 4 Shows the frequency of similar length words in train data (pink) and test data (orange)

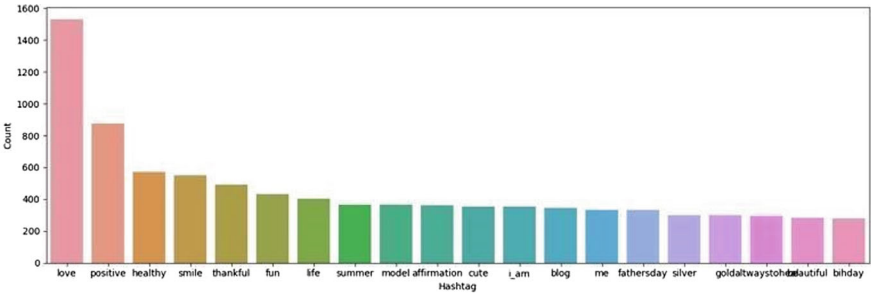


Fig. 5 Frequency of positive hashtags

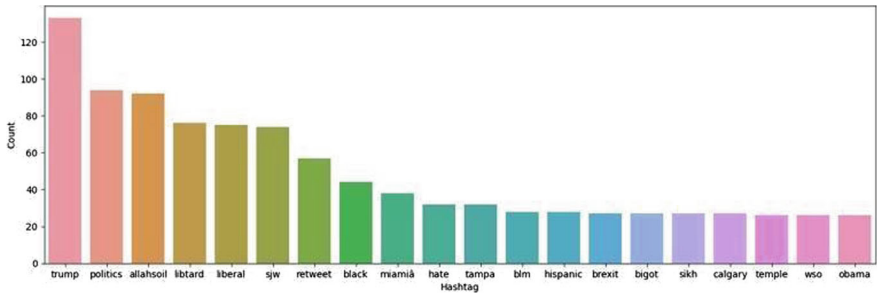


Fig. 6 Frequency of negative hashtags

machine learning models, including the Random Forest Classifier, Logistic Regression, Decision Tree Classifier, Support Vector Classifier (SVC), XGBoost Classifier, Linear SVC, Naive Bayes, Voting Classifier, Gradient Boosting Classifier, and MaxEnt (Maximum Entropy Classifier). Assessment metrics including accuracy, F1 score, and confusion matrices were employed. Ensemble methods to bolster model accuracy and resilience. Moreover, real-time sentiment analysis for dynamic public infrastructure monitoring presents an enticing prospect. Nevertheless, it's crucial to acknowledge the study's limitations, including dataset availability and scope, alongside external factors potentially impacting model performance.

Table 1 shows the results highlighted the XGBoost Classifier's highest validation accuracy of 95.51%, closely trailed by the Voting Classifier and Random Forest Classifier. While the Random Forest Classifier exhibited the highest F1 score of 0.6121, the XGBoost Classifier demonstrated superior accuracy. Confusion matrices provided nuanced insights into model performance across various classes as shown in Fig. 7.

In essence, our study underscored the efficacy of machine learning models in scrutinizing sentiment within the realm of public infrastructure. Future research avenues

Table 1 Comparison of algorithms with accuracy

Algorithm	Training accuracy (%)	Validation accuracy (%)	F1 score (%)
Random forest classifier	99.91	95.25	61.20
Logistic regression	98.48	94.31	59.89
Decision tree classifier	99.91	93.21	54.45
SVC	97.8	95.21	49.8
XGB classifier	96.08	95.50	57.51
SVM	97.58	93.00	54.95
Maxent classifier	100	93.11	17.64
GaussianNB	66.25	66.32	25.22
Voting classifier	98.93	95.43	58.09
Gradient boosting classifier	95.18	94.76	43.81

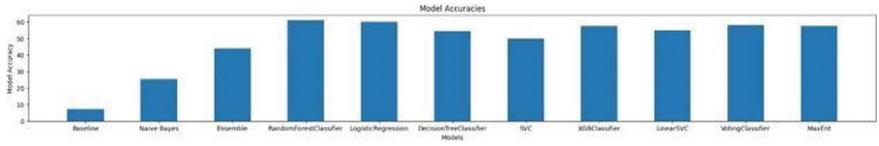


Fig. 7 Different models used and its accuracies (based on F1 scores)

could explore advanced techniques like deep learning approaches and offer deeper insights into public perception and infrastructure planning.

5 Conclusion

This research paper has delved into the intricate realm of sentiment analysis in social media texts, offering a comprehensive examination of methodologies, challenges, and applications within this burgeoning field. Through an amalgamation of literature review and empirical experimentation, we have unearthed significant insights that contribute to the advancement of sentiment analysis techniques in the context of social media discourse. The standout achievement of our study lies in the identification of the XGBoost Classifier as a potent tool for sentiment analysis on social media platforms, particularly Twitter. Its remarkable accuracy and balanced precision-recall trade-off underscore its potential for real-world applications, presenting opportunities for informed decision-making in fields ranging from marketing strategies to crisis management.

Looking ahead, our study lays the groundwork for several promising avenues of future research and enhancement. Firstly, the exploration of advanced techniques, including deep learning approaches and ensemble methods, holds the potential to further elevate model accuracy and robustness in sentiment analysis tasks, particularly in navigating the complexities of social media discourse. Secondly, the pursuit of real-time sentiment analysis for dynamic social media monitoring presents an exciting frontier, offering timely insights into evolving trends and public opinion dynamics, thereby enabling proactive decision-making in response to emergent issues. Without some form of summarization or filtering, performance is necessarily limited by the presence of extraneous and potentially misleading appraisal in the document. Thirdly, the expansion of datasets to encompass greater diversity and scope would mitigate limitations associated with data biases and generalization constraints, fostering more reliable and generalizable sentiment analysis models. Lastly, the consideration of external factors, such as temporal trends, cultural shifts, and platform-specific dynamics, promises to enhance the contextual relevance and accuracy of sentiment analysis outputs in real-world scenarios. In conclusion, our research endeavors have not only contributed to advancing the field of sentiment analysis in social media texts but have also paved the way for future innovations and applications in harnessing the power of social media data for understanding public

sentiment and opinion. By embracing these future enhancements, researchers can continue to unravel the complexities of social media discourse, unlocking invaluable insights that inform decision-making and drive societal impact.

Cross-lingual Analysis: Extend sentiment analysis capabilities to support multiple languages, enabling analysis of social media content in diverse linguistic contexts. This may involve developing multilingual models or leveraging cross-lingual transfer learning techniques. User-level Analysis: Explore methods for user-level sentiment analysis, identifying individual user preferences, sentiments, and behavior patterns on social media platforms. This can provide personalized insights for targeted marketing campaigns and user engagement strategies. Ethical Considerations: Continue to prioritize ethical considerations in sentiment analysis research, addressing issues such as bias, fairness, and privacy to ensure responsible technology development and deployment.

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Educational and Administrative Planning in the Digital Age: Integrating Technology to Improve Academic and Administrative Performance



Safeyah Tawil and Alalddin Al-Tarawneh

Abstract This study seeks to comprehend the influence of both educational and school plans on academic performance, as well as to identify ways to integrate these plans to improve educational outcomes and refine teaching strategies in accordance with overarching educational objectives. Utilizing a descriptive methodology as its main approach, the study is well-suited to the topic and nature of the research, enabling a thorough analysis of data and offering clear insights into relationships and trends. The primary findings of the study highlight the significant distinctions between the two plans and their effects on educational performance and teaching efficacy. Notably, the educational plan emphasizes the establishment of long-term educational objectives, whereas the school plan is geared towards short- to medium-term goals and their immediate execution. In light of these findings, the study advocates for enhanced coordination between the educational and school plans to more effectively realize educational goals and improve communication among all stakeholders in the educational process for optimal integration.

Keywords Educational planning · School plan · Teaching effectiveness · Teaching strategies · Education development · Educational performance · Educational integration

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1 Introduction

Fundamental components that aid in reaching educational and pedagogical objectives in educational institutions include both the educational plan and the school plan [1, 2]. The educational plan is centered on crafting and executing strategies that foster academic and personal growth in students, whereas the school plan concentrates on the organization and management of every facet of the educational process within the school, ensuring a holistic and effective learning atmosphere [2–4].

The process of education starts with establishing educational objectives and programs tailored to meet the needs of students [5]. This is followed by the development of teaching approaches and their execution, ending with an evaluation of how effective those objectives and programs are [6]. The school development plan, on the other hand, is concerned with guiding the administrative and organizational components of the institution—resource management, scheduling, and creating a proper learning-teaching environment [3, 7].

Understanding how these two plans relate to one another is key to harmonizing and unifying the educational and administrative dimensions, which in the end will enhance the quality of education and better academic results [8, 9]. Therefore, fusing various components of both the educational plan and the school plan into one unit can greatly help achieve success in academics and improve school performance in general [1, 10, 11].

The chapter will look at the ideas of a curriculum and a school curriculum in this context, evaluate the different dimensions for each, and consider their stages of development and implementation. Furthermore, it seeks to clarify the relationship between these two concepts and how they integrate to successfully attain educational objectives. Additionally, a thorough overview of the school planning process in Saudi Arabia will be presented.

1.1 Study Objectives

This study aims to achieve the following objectives:

- Analyze the concept of an educational plan and a school plan and define their relationship.
- Analyze the stages of developing and implementing an educational plan.
- Analyze school planning in Saudi Arabia.
- Make recommendations for developing policies and practices for educational and school planning.

1.2 Study Methodology

To meet its objectives, this study employed a descriptive methodology, which offers a thorough and precise examination of the concepts related to the educational plan and the school plan, assesses their impacts, and differentiates between the two. Reflecting the analytical essence of the research, the descriptive methodology facilitates a systematic investigation of the relationships and patterns present in the data, thereby aiding in the formulation of effective recommendations grounded in a profound comprehension of the subject matter.

2 The Educational Plan

This chapter explores the educational plan from multiple viewpoints, encompassing its definition, core concept, various dimensions, and the phases of development and execution. It stresses the relationship between the educational program and the school program, showing ways of making them work together in a reinforcing manner towards achieving effective educational goals [12]. Moreover, it discusses the coordination of the various dimensions of the curricular plan, right from the setting of instructional objectives to the implementation of teaching–learning methods and evaluation while studying the interdependent influence of both curricular and school programs on enriching pedagogy and realizing scholastic attainment [13].

2.1 Concept of the Educational Plan

According to [3], an educational plan is explicitly referred to as an organizational process intended to achieve specific educational and pedagogical goals. The process typically involves several stages, beginning with setting educational goals—for example, increasing academic performance or improving the quality of education—and follows up by developing programs of education plus the implementation procedures and evaluation techniques that ensure efficiency in attaining those goals within a specific period and appropriate resources.

In the same manner, [4] described the educational plan as the structure of planning into a program where planning is divided into separate phases with specific points or periods, coupled with carrying out some actions to ensure that a given goal is met. Alhalalmeh [1] emphasized that the educational plan involves a well-specified set of educational aims, the techniques used, and activities created to satisfy those objectives. From these definitions, the researchers perceive the educational plan as an all-encompassing organizational structure focused on attaining particular educational and pedagogical objectives through the systematic arrangement of various activities and procedures. This includes defining goals, creating educational programs, and

executing effective evaluation methods. Additionally, this framework encompasses scheduling and the allocation of resources to reach the intended objectives, alongside implementing necessary actions and measures.

Types of Educational Plans

There are several types of educational plans, including [4]:

- **Annual Plan**: It concentrates on structuring the curriculum's content in line with defined educational aims for the academic year, which involves setting the year's educational objectives and allocating the curriculum throughout the months or semesters.
- **Term Plan**: It is included in the yearly plan that is made of the objectives, activities, and educational events designated for each term. This plan systematically arranges the teaching content in a logical and progressive way, aiding in the attainment of educational goals with greater specificity.
- **Daily Plan**: It involves the meticulous organization of daily learning activities, encompassing educational programs and experiences that prioritize ongoing and direct engagement with students' needs, skills, and potentials.

The researchers highlight the necessity for these various educational plans to collaborate in order to fulfill educational objectives. Effective coordination among these plans strengthens the educational system's capacity to address students' needs and attain success in education.

Dimensions of the Educational Plan

The [5] study identified several essential elements that should be included in educational plans:

- **Educational objectives**: It is the heart of the educational plan, including what students should achieve in a given educational period. These objectives should be objective, specific, measurable, and assessable, guiding all educational activities directed at students and helping to assess their progress.
- **Strategies**: these are principles, methods, techniques, and foundations that facilitate the acquisition, application, and retention of learned material in specific contexts. These strategies include teaching methods, educational activities, and techniques used to support the educational process directed at students.
- **Resources**: These are all tools and materials that facilitate teaching and achieving the objectives of the educational plan, including equipment, technology, books, the classroom environment, and assistive technologies.
- **Skills**: These are aspects to focus on in order to strengthen, develop, and improve, which may include academic, social, motor, or communicative aspects.
- **Educational resources**: Resources are used to support the educational process, such as books, websites, educational videos, interactive games, social stories, flashcards, and audio materials that contribute to the development of students' skills.

- **Assessment**: It is a key indicator of an educational plan that measures a student's progress toward achieving the goals of the plan. Evaluation methods include standardized tests, observations, behavioral assessments, and progress reports. Evaluation is key because it provides flexibility to educational plans, especially since plans are ongoing and adaptable.
- **Timeline**: It is the timeline for achieving the goals of the educational plan and the periods of implementation. This requires plan implementers to be familiar with time management and organization strategies.
- **Evaluation**: The final element of designing educational plans, related to the established goals. The evaluation process analyzes the student's progress toward achieving the educational goals established in the first element of the educational plan.

The educational plan is viewed by the researchers as a crucial instrument that boosts the efficiency of the educational process and plays a vital role in reaching educational objectives [14]. A thorough educational plan can be crafted by incorporating its eight components, allowing it to address students' needs while fostering their academic and social development.

Stages of the Educational Plan

According to [6], the educational plan involves several stages, including:

1. **Defining educational goals**: This step defines the goals and objectives that the plan aims to achieve, whether they are educational, behavioral, or developmental. It is important that these goals are clear, measurable, and achievable.
2. **Resource analysis**: This step evaluates the available resources, such as teachers, curricula, educational tools, and infrastructure. This analysis also includes assessing the gaps between the current resources and what is required to achieve the goals.
3. **Data collection and analysis**: This step collects data on students, the educational environment, and the school community in general. Analysis of this data helps in understanding the real needs and guiding the plan towards practical solutions.
4. **Developing and evaluating alternatives**: This step considers multiple strategies to achieve the goals. Each alternative is evaluated based on its effectiveness, cost, and feasibility.
5. **Selecting the appropriate strategy**: After evaluating the available alternatives, the most appropriate strategy or approach is selected to achieve the goals with the highest efficiency and lowest cost.
6. **Implementation of the plan**: In this phase, the plan is transformed into actionable steps, including defining roles and responsibilities, establishing a timeline, and establishing criteria for measuring progress and success.
7. **Ongoing monitoring and evaluation**: In this phase, the implementation of the plan is periodically monitored and the results of each phase are assessed. Monitoring and evaluation are conducted using assessment tools to determine the extent to which the goals are being met, identify any obstacles that may arise at any stage of the educational plan, and make adjustments to the plan if necessary.

8. **Review and update**: Once the plan has been implemented and final results have been achieved, the entire plan should be reviewed to identify gaps that could be addressed in future plans to improve educational planning.

From the viewpoint of the researchers, these stages illustrate an ongoing cycle designed to perpetually enhance the educational process while guaranteeing the efficient and effective attainment of educational goals [15]. Additionally, the researchers underscore that adhering to these stages is not just an alternative but an essential requirement for effective educational planning and realizing the intended results [16].

2.2 The School Plan

The school planning team undertakes a detailed administrative process known as the school plan, aimed at articulating the vision, mission, and objectives of the institution. This task involves a deep analysis of the school's internal and external environment to identify all factors that impact the working of the school [6, 17]. From this assessment, crucial priorities and objectives are set to ensure the vision and mission of the school will be met [7, 18].

The school plan is, according to [8], a roadmap for school personnel to coordinate all activities related to the school with high effectiveness and proper integration of all components of the educational process that will lead to the achievement of educational goals. An organizational tool that captures and outlines specific details regarding what transpires within the teaching/learning experience in an educational setting is what this plan is.

The school plan is identified as a strategic document that drives improvement in school performance and student success through the delineation of key goals, priorities, and activities aligned with the vision and mission of the school [19]. This information was obtained by [9]. This plan is built upon a holistic and cohesive perspective of the school and is crafted with a strategy intended to enhance both academic and administrative performance within the institution [20].

Based on these definitions, the researchers perceive the school plan as a thorough strategic document that directs school operations and establishes priorities to fulfill the vision and mission of the school [21]. By merging environmental analysis with goal setting, this plan offers an organizational framework that guarantees the integration and coordination of all school activities, ultimately aiding in the enhancement of both academic and administrative performance while improving student success and educational outcomes.

Importance of the School Plan

According to [10], the importance of the school plan is reflected in the numerous benefits it provides to the school, including:

- Establishing a future vision for the school based on an analysis of its current situation and possibilities.
- Fulfilling the school's mission and goals and implementing positive changes for students and the community.
- Focusing on fundamental issues related to the reality and future of the school.
- Making strategic decisions to address internal and external challenges surrounding the school.
- Enabling the school administration to adapt to environmental changes and improve the school's situation.
- Increasing cooperation and participation between members of the school community and the local community.
- Providing a basis for measuring the school's progress throughout the academic year and establishing a mechanism for change when necessary.
- Increasing the productivity, efficiency and effectiveness of the school.
- Providing an intellectual foundation in the school for formulating, reviewing and adjusting educational goals, plans and policies.
- Fostering a sense of control, evaluating results and managing the school's future.

From the viewpoint of the researchers, the school plan acts as a guiding compass that aligns all efforts of the institution with its educational and administrative objectives [22]. It goes beyond merely organizing school activities; it embodies a strategic framework that outlines the future vision of the school and positions it effectively to tackle challenges while addressing the needs of both students and the community [23].

2.3 Educational Plan versus School Plan

The school plan and the educational plan are essential components that play a crucial role in structuring and enhancing the educational experience within schools. While both plans are intricately connected to the educational process, they vary in their aims and scope [11]. Table 1 that outlines the distinctions between the two plans:

Based on the previous discussion, the researchers assert that the educational plan emphasizes the developmental and educational dimensions of students, whereas the school plan prioritizes administrative and organizational elements to create a cohesive and effective learning atmosphere. The interplay between the educational plan and the school plan is viewed as complementary; the success of either plan hinges on the alignment and collaboration between the two. The educational plan establishes the framework that directs daily activities within the school, while the school plan guarantees the availability of essential resources and infrastructure to uphold this framework. Consequently, the synergy between these two planning types plays a crucial role in fostering an effective learning environment that nurtures student growth and progress.

Table 1 Differences between the educational plan and the school plan

	Educational plan	School plan
Scope	The educational strategy encompasses a variety of activities and curricula designed to promote both the academic and personal growth of students. It emphasizes the attainment of well-rounded educational objectives, including the cultivation of social skills, the enhancement of ethical values, and the encouragement of critical thinking in learners	The plan for the school emphasizes the organization and management of all aspects, encompassing administrative, infrastructural, and organizational elements. This includes overseeing school resources, coordinating schedules, facilitating extracurricular activities, and implementing emergency procedures
Objectives	The goal is to direct students in reaching their fullest educational and personal capabilities. Additionally, it seeks to foster better student behavior and improve their engagement with both the school setting and the broader community	The objective is to facilitate the effective and seamless operation of the educational process within the school. Additionally, it strives to enhance the school atmosphere by creating a supportive learning environment and guaranteeing the accessibility of resources necessary for reaching educational objectives
Components	It encompasses comprehensive teaching outlines, instructional methods, engaging activities, along with psychological and social support initiatives for learners	It encompasses yearly planning, timetable creation, allocation of teachers, budget focus areas, and making sure that general educational policies are followed

Source Prepared by the researcher based on [11, 24–26]

3 School Planning Between Theory and Practice

At the heart of administration lies planning, which is a crucial component of effective management. As administrative concepts have developed, different forms of planning have surfaced, with school planning standing out as particularly advantageous for managing educational institutions. This planning type accentuates the use of both material and human resources within the school whether by making use of already available opportunities or addressing the problems and risks in the school [12].

The basis for academic achievement and improving quality education in schools is school planning. It is a systematic setting up of educational goals and organizational strategies to ensure that they will be effectively achieved [12].

Carvalho et al. [13] states that the theoretical dimension of school planning highlights its vital role in shaping the educational process. However, practical difficulties can stand in the way of achieving what the planning is aimed at. This theoretical framework provides a global approach that takes into account different components related to the school in setting educational goals, distributing curriculum content, and organizing education activities adapted to students' needs and skills. But in practice,

schools may find it hard to implement these plans as they were drawn up based on surrounding conditions and resources at hand [27].

This case requires the blend of theoretical concepts with the actual implementation of school planning, which calls for continuous assessment of educational strategies and re-adjustments to fit the dynamic situational and environmental factors at the school so as to ensure that educational goals are met.

3.1 School Planning in the Kingdom of Saudi Arabia

Educational operations in schools in the Kingdom of Saudi Arabia are centrally based on the curriculum plan. Considerable attention and care have been devoted by the Ministry of Education to every feature of this plan, planning, organization, and implementation. This focus arises from the crucial role that curriculum plans play in enhancing the quality of education, leading to the establishment of a dedicated center for curriculum development within the ministry [9].

On the 9th of September in the year 2019, a primary committee was established by the Minister of Education to manage the formulation of curriculum plans and programs, ensuring their alignment with the Kingdom's developmental requirements as part of Vision 2030. During Ramadan of the same year, the Minister of Education sanctioned an executive program focused on enhancing pathways and curriculum plans at the secondary education level, with the goal of improving outcomes in secondary education and equipping students for the job market [14].

The Curriculum Development Center performs analytical studies and formulates development proposals by referencing practices and making international comparisons to enhance learning outcomes. A significant accomplishment of the center is the publication of the curriculum plans guide, which details essential developmental processes in school planning grounded in scientific principles to improve educational quality and advance the educational system [14]

As outlined in the Curriculum Plans Guide published in 2023, Saudi Arabia is experiencing notable advancements in its curriculum plans to align with Vision 2030. These advancements focus on enhancing the quality of education and addressing the requirements of students and the community. Key elements of these advancements encompass [14–18]:

- **Redistribution of Subject Weightings**: This was done to achieve the educational goals of each subject based on the actual needs of students. This redistribution was implemented by increasing the number of hours taught in subjects such as Arabic, Science and Mathematics, in line with practical needs and to prepare students for international tests.
- **Introduction of New Subjects and Development of Existing Subjects**: New subjects were introduced and existing subjects were developed as part of the curriculum improvement. For new subjects, English is introduced from the first grade using Practical Publishing's "Can We" series, digital skills from the fourth

grade, critical thinking from the third grade of secondary school and the first grade of secondary school and self-defense from the first to the third grade of secondary school. Existing subjects such as Social and Family Skills and Physical Education were expanded to include both boys and girls.

- **Integration of e-learning**: E-learning was integrated as a core element of the curriculum, making it a required component at every stage and in every grade.
- **Splitting the academic year into three semesters**: To increase the number of teaching days and provide more time for activities supporting learning.
- **Implementing common and specialist tracks in secondary education**: Using advanced curricula from Practical Publishing such as Cengage and Binary Logic, and introducing specialist tracks in the third year of secondary school, starting in the academic year 2023.
- **Increasing focus on the Quran**: An additional memorization lesson plan was approved, separate from the basic approved plans. External school plans were also developed to align with the overall educational plans in common subjects, while supporting memorization of the Quran and encouraging recitation.
- **Developing learning plans for students with disabilities**: New subjects such as English, digital literacy and social studies were added to increase learning opportunities and improve student achievement. The curriculum was adapted to the specific learning objectives for this group, and alternative communication methods and technologies were improved.
- **Development of Curriculum Plans for Kindergarten**: Improvements to the curriculum have been made to meet the developmental needs of children in kindergarten.
- **Development of Curriculum Plans for Scientific Institutes**: Supervision of Scientific and Modern Institutes has been transferred to the Ministry of Education for secondary and junior high schools, with special emphasis on teaching religious sciences and Arabic, especially in the secondary and third grades.

It is worth noting that technology plays a vital role in supporting school planning in Saudi Arabia, contributing to the improvement of education quality and the development of administrative efficiency in educational institutions [19]. By integrating technology into planning, several key benefits can be achieved [15, 20–23]:

1. **Data Analytics and Performance Management**: Technology tools such as School Management Systems (SMS) and Big Data analytics enable accurate tracking of student and teacher performance. Exam results can be analyzed, student performance can be assessed, and areas for improvement can be identified, which helps in making informed decisions and developing effective educational strategies.
2. **Curriculum Planning**: Technology enables the development of flexible and adaptable curricula that meet the diverse needs of students. Through the use of digital learning tools and e-resources, educational content can be regularly updated, and modern teaching techniques such as Smart Learning and Blended Learning can be incorporated.

3. **Administrative Automation**: Digital systems help in streamlining and managing administrative processes such as student registration, scheduling, and resource management. This increases the efficiency of administrative processes and reduces the administrative burden on educational staff.
4. **Training and Professional Development**: Technology provides specialized training platforms for developing the skills of teachers and administrators. Teachers can take advantage of online training courses and workshops to improve their teaching techniques and adopt new educational strategies.
5. **Improved communication and collaboration**: Technology tools improve communication between schools and parents, facilitating easy exchange of information and tracking of student progress. In addition, technology supports collaboration between schools and educational communities on a broader scale, promoting the exchange of experiences and best practices.

With these technological solutions, the education system in Saudi Arabia can achieve its goals more effectively and efficiently, contributing to improving the quality of education and preparing students to face the challenges of the future.

4 Conclusion

This chapter brings out the very vital importance of educational planning and school planning so as to enhance the quality of education and meet the objectives of education in a more effective way. An educational plan is vital for structuring educational activities and processes that help realize the goals of education by specifying objectives, formulating programs, implementing assessment approaches, and providing necessary resources. An educational plan has several dimensions—goals, strategies, resources, skills, learning materials, assessment, and scheduling which combine to provide a complete framework that success in the educational venture is guaranteed. On the other hand, school planning is at the heart of effective school management. It means using available resources to address the problems and improve education quality. Thereby striking a balance between theoretical concepts and their practical implementation, plans need to be reviewed regularly and updated as the circumstances change in order to meet adequately students' needs. Under the Saudi Vision 2030, there shall be a weighty focus on school planning. The Ministry of Education shall implement vocational training programs that ensure education market alignment while enhancing educational outputs. This reflects a commitment to educational quality through strategically planned strategies based on an integrated vision. The final synthesis of both educational and school planning creates a solid foundation for achieving pedagogical and educational goals that improve the student-learning process and enhance its quality.

4.1 Study Results

- The research highlighted the necessity for a clearer definition of concepts related to education and school planning, improving comprehension of their interconnections and how their aims work together to fulfill educational goals.
- The research highlighted difficulties encountered during both the development and execution stages of educational initiatives, including a lack of resources and discrepancies with the real needs of schools.
- The research indicated that educational policies in Saudi Arabia have played a role in enhancing school planning; however, additional support and oversight are necessary to guarantee the attainment of established objectives.

4.2 Recommendations

- Clearly and comprehensively define educational planning and school planning in educational documents and practices.
- Develop strategies to ensure better integration between educational plans and school plans, focusing on aligning goals and procedures.
- Develop mechanisms to assess the effectiveness of the implementation of school and educational plans and provide the necessary support to educational institutions in addressing challenges.
- Provide training and professional development for educational and administrative staff to ensure better understanding and implementation of plans.
- Recommend reviewing and updating national education policies to adapt them to changes and the actual needs of schools and communities.
- Increase the involvement of local communities and parents in the planning and monitoring of educational plans to ensure effective results.

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Technological Innovation and Inclusivity: Ensuring Equitable Access to Social Security Services in the Digital Age



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Abstract The delivery of social security services is being transformed by technological innovation, which presents new opportunities for fostering inclusivity and equal access. Historically, social security systems were aimed at assisting individuals excluded from formal employment, particularly the elderly. However, modern welfare states are now confronted with what can be described as recent challenges due to significant shifts in the workforce driven by urbanization, globalization, and technological progress. This research will investigate how digital platforms, biometric systems, and automation contribute to achieving inclusive social protection services, particularly for vulnerable groups such as informal workers and economically disadvantaged individuals. Utilizing a qualitative approach that combines descriptive and analytical methods, this chapter will review existing literature, policies, and technological implementations to identify gaps and potential biases that impede full inclusivity. This analysis underscores the urgent need for reforms that adopt a comprehensive perspective, ensuring that advancements in social security services are inclusive, equitable, and accessible to everyone.

Keywords Technological innovation · Inclusivity · Social security services · Equitable access · Digital platforms · Biometric systems · Automation · Globalization · Informal workers · Welfare state · Social protection

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1 Introduction

The transformation of social security services through technological innovation is both profound and fundamental, occurring in an unprecedented way [1, 2]. Historically, the legal framework supporting these services was mainly established to offer income assistance solely to those excluded from the conventional structure of formal employment contracts, especially during old age [3, 4]. However, advancements in society have driven nations toward increased urbanization and a growing array of informal work environments [1, 5]. Consequently, the demands on contemporary welfare states have escalated significantly [6, 7]. The labor market has faced unparalleled volatility, influenced by globalization and the rise of advanced technologies [8, 9]. As a result, the urgent need for a renewed collective commitment to social protection has become unmistakable [10]. This commitment is a safeguard in ensuring that inclusive access to minimum income and essential services is available; this irrespective of age, employment status, family circumstances or asset accumulation [2, 11]. Therefore, inclusivity should never be assumed [12]. If social protection systems were to remain unchanged, then there is a significant danger that benefits and resources will be increasingly targeted only towards those in the active workforce [13]. Unfortunately—in the face of striking wealth and prosperity—many governments have overlooked, time and time again, their basic obligation toward supporting and assisting the most vulnerable populations within their societies [2, 14]. Instead of addressing the issues of poverty and hardship afflicting the poorest individuals, they distanced themselves from these urgent matters by making survival an end goal in itself. This chapter is about the need to address these challenges, driven by compelling empirical evidence and very high on the scale of that is proper legislation. It seeks to shed light on the ever-evolving landscape of social security services and the presence that is felt of comprehensive reforms which place a priority on the well-being and protection of every individual, no matter what their lot in life.

1.1 Research Objectives

This chapter aims to explore the newly emerging debate regarding the relationship between technological progress and the obligation to provide social service benefits, highlighting its significance and the lack of attention it has received from scholars. Our analysis will navigate through a variety of methodologies, build upon existing research, and support substantial recommendations. The focus of this chapter is on how new technologies can ensure that every individual has access to at least a basic social security system. By adopting a continuum and a cross-border perspective that embraces inclusive diversity, we will create a comprehensive framework of decision-making levels, fostering an environment for innovation and maximizing the advantages that digitization offers humanity.

1.2 Research Significance

The current dynamic digital landscape makes this study highly pertinent. As innovations in technology transform the delivery of social security services, there is an increasing potential to either foster or hinder inclusivity. This chapter aims to highlight the critical importance of ensuring that technological progress does not exacerbate existing inequities, particularly for marginalized groups that are frequently excluded from traditional employment structures. By examining the interplay between technology, social security, and inclusivity, the research underscores the urgent necessity for universal equitable access to social protection services. It outlines the dangers posed by the digital divide and advocates for reform-minded practices that address the needs of vulnerable populations—such as elderly informal workers—who are economically marginalized, focusing on active workforce participants while neglecting those in precarious situations with no opportunities. Through an emphasis on comprehensive changes, this study aspires to contribute to the development of a more equitable and inclusive welfare state, where technological advancements serve as instruments to enhance access to vital services rather than obstacles. It underscores the significance of inclusive digitalization within contemporary social security systems, making it essential for decision-makers, public administrators in social security, and IT professionals who are shaping the future of social protection in the digital age.

1.3 Research Methodology

The research adopts a qualitative approach by utilizing both description and analysis as a framework for reviewing specific literature. The descriptive method integrates various case studies and policy reports centered on technology and social security. More innovatively, it aims to offer an analytical perspective on how different papers examine the topic from diverse angles at the synthesis level. This chapter emphasizes the viewpoint that various technological advancements strive for greater universalism through digital platforms, biometric systems, automated service delivery, and other technological transformations that assist government initiatives in including, excluding, and targeting specific behaviors of populations or individuals. Therefore, when assessing the impact of innovations on inclusivity, we can better understand both the opportunities and challenges present within existing frameworks. By blending descriptive and analytical techniques, this research may provide practical insights and recommendations for policymakers. This will contribute to ensuring that digital innovations promote inclusivity rather than exacerbate inequality in the delivery of social security services.

2 Understanding Technological Innovation in Social Security Services

Social security services are experiencing various forms of technological innovations. The most notable advancement is the transition from physical services to digital platforms, which has resulted in numerous advantages [2, 16]. This shift is enabled through the development of mobile applications that are meant to deliver services and social protection programmes more efficiently than ever [17]. Through these state-of-the-art apps, implementers can easily trace the progress of their applications which in turn gives them instant accessibility details about their requests [18]. These apps do not only provide invaluable information to service providers but also give insight towards comprehension of user experience thereby facilitating the appropriate improvements. The innovation in data analytics has drastically changed how social protection services are managed [19]. From the analysis metrics collected from mobile applications, it gives a detailed comprehension of user behavior. This includes identifying the most frequently used platforms, common problems during filing, processing and payment distribution phases as well as measuring specific duration for each step [3, 20]. Armed with this extensive information, implementers can take a proactive approach in addressing any emerging challenges thus smoothening the process for all parties [21].

The infusion of technology into social security services has unquestionably enabled such innovative enhancements that act as robust channels and elevate the delivery of this vital service [4, 22]. Moving away from traditional methods to digital platforms enables individuals to easily access and track their applications, and service data analysts can always improve the process. With such dynamism that is a continuous feature, the prospects of social protection services in the days to come are bound to witness even higher echelons of efficiency, accuracy, and accessibility for those in need of help [23].

This comprehension informs the range of strategic choices concerning policy deficiencies and development, as indicated by digital governments [24]. Transitioning any physical service into a digital format can lead to reductions in waiting times, costs associated with optimal service, resources required by providers and policy implementers, and overall time expended [25]. These factors have prompted numerous national and international governments to adopt an e-government strategy [5, 26]. Additionally, there is a shift towards AI-driven solutions aimed at not only delivering timely and superior services but also at reducing the effort needed for maximizing resource efficiency [27]. This phenomenon is recognized as an extension of the fourth revolution, which boasts high effectiveness in service delivery while simultaneously provoking concerns among various stakeholders [28]. Such concerns may pertain to the safeguarding of personal data, privacy and confidentiality issues, potential hacking of sensitive personal and policy information, reliance on technology for accessing services, and an increased risk of unemployment in human services, alongside violations of data protection laws [29]. Consequently, it is crucial to concentrate on these advancements when shaping policy governance [30].

Technology should not merely be viewed as a checklist item; its significance extends beyond that in several critical aspects. It is essential for governments to formulate a strategy that addresses the necessity for integration by establishing a guiding principle [6, 31]. This strategy must also clearly outline the service requirements. Furthermore, as we advance into the fourth Industrial Revolution, policymakers should continuously adapt and refine privacy concerns, digital identity, and other pertinent policy measures to remain vigilant [32].

3 Challenges to Inclusivity in the Digital Age

The inclusivity of digital services is severely limited by a number of inter-related challenges [33]. The first of these challenges is what is known as the Digital divide, this emphasizes the unequal access and usage of digital platforms, devices, and services among different segments with a special focus on those who are marginalized or in at-risk situations [7, 34]. With 1 in 5 people globally still without access to digital technologies, this issue remains critical given that marginalized populations are disproportionately represented among those lacking access. [9, 10, 35] The other challenges include digital literacy hinging on the skill levels of citizens which is often influenced by age; and also the relationship between socio-economic status and broad band's technical aspects as well as device types and access costs. These directly determine the practical application of digital skills [36].

Digital inclusion is a major worry that comprises several interrelated challenges. The large hurdle is the digital divide which manifests as inequitable distribution of digital resources across societal groups, especially the marginalized or vulnerable [7, 37]. These individuals face substantial difficulty in accessing and using digital platforms, services, and devices [38]. The share statistic tells us that 1 in 5 people around the world are not connected to digital technologies; such efforts become crucial needs of this problem for weed out [8]. Equally important to note is that within this demographic they are heavily over-represented who have difficulties with barriers [39]. Besides the digital divide there are other equally important challenges that impede restrictions on digital inclusion per additional critical challenge [40]. One of them is the Digital literacy which depends on an individual's skills where age is one cause area limiting skill acquisition to fully participate in the digitally-enabled environment [9]. Besides, the access to broadband is influenced by socio-economic status and so are the types of devices available and their cost [10]. The technical factors relate directly to the real impact and application in practice of digital skills [11]. Tackling these dependent problems is central for nurturing a digital environment that accommodates diversity because this is what we aspire toward [7]. Indeed, closing that divide, ensuring equity in access to digital resources for all (especially the most vulnerable) through promoting digital literacy, and availing educational and training opportunities which facilitate empowerment on an individual level at any age towards enhancing their digital abilities and effective navigation online are the ultimate aim [10]. Additionally, initiatives aimed at reducing socio-economic

inequalities should be introduced, such as making broadband more affordable and lowering the expenses associated with digital devices [8]. By confronting these issues, we can advance towards a digital future that is equitable and inclusive for all [12, 13].

Moreover, individuals with low digital literacy are not only disproportionately represented within the same socio-economic groups as those who face digital exclusion, but they also rely heavily on the assistance of civil society and government to address social and political issues [11, 14]. Furthermore, inadequate co-design of digital systems raises alarms that depending on digital technologies for delivering social security might actually lead to less equitable outcomes for citizens due to the rising levels of surveillance aimed at enhancing the automation of public services [15]. Currently, these technological advancements and processing methods tend to accelerate more quickly for those in less favorable circumstances, thereby worsening existing disparities [16]. The issues of increased algorithmic bias related to this, along with unequal data sovereignty and the sharing of citizens' data, present significant ethical and practical challenges that must be considered in the design and implementation of effective digital services [12, 17]. Consequently, there is an escalating concern that proficiency with and access to digital technologies are pertinent not just to social inclusion levels, but also to the execution of digital services themselves, underscoring the necessity for comprehensive strategies to close the digital divide [18, 19].

In conclusion, while it might not be the main cause of social exclusion, without digital technologies, people are very significantly hampered in their ability to engage with and get social services that would impede their full participation in the digital era—which reinforces social inequalities [20, 21]. Also, we need to realize that the consequences of digital exclusion are not only at the individual level but also concern broader societal frameworks and power relations. Because those who do not have digital literacy and do not have access will meet additional barriers in areas across the board—from education, through employment and health to civic participation [13]. Digital skills differences create another aspect of division (digital divide), deepening differences between those included among the underprivileged and excluded [22, 23].

The division affects the people and acts as a barrier to the development of the human societies at large. Insufficient digital inclusion has effects that are wide and varied [25]. As the world moves towards more digital dependence, those without access or skills find themselves left out of this new way fully able to take advantages and benefits that come with it [14, 24]. This social exclusion further marginalizes those who were already experiencing some form of inequality; thus creating a cycle where one is unlikely to move up in terms of social strata [26]. Moreover, if they do not have digital literacy added onto preexisting economic disparities, educational lack means also an inability even further disenfranchised from participating fully as active citizens members influence decisions being made within society on top about opportunities available for their disposal about change initiatives needing support—since without presence of online platforms, their voice will be unheard and sidelined from conversations taking place in public spaces [27, 28]. To address these pressing

issues, collaborative efforts must be initiated. Governments, non-governmental organizations and technology companies need to work together to close the digital divide and ensure that access is truly universal and equitable [15, 29].

Developing and implementing inclusive digital policies and specific educational programs can empower the individual as well as the community to navigate the digital domain with confidence and capability [30]. Risk of promoting unethical practice in those spheres is vital for developing healthy levels of consciousness and comprehension related to ethical dimensions [31, 32]. The critical components of creating a fair, inclusive digital world are defending privacy, weighty consideration of algorithmic bias, and being proponents of digital rights—right is something more than a simple legal norm; it is a fundamental element of justice [33]. Addressing issues of digital divide goes beyond technological progress only; it is a burning question for social justice that should be solved. [1] Breaking barriers on the way toward acquiring digital literacy and gaining access allows working on creating inclusive/developed societies where everyone has equal opportunities for development which derive empowerment from them [2]. To unleash potential opportunities borne by the digital age demands joint efforts: only through them can we ensure that no one will stay aside while building common future [34].

4 Strategies for Ensuring Equitable Access to Social Security Services

This part focuses on the various obstacles faced by marginalized populations when trying to access digital and mobile social security services. Here, we intend to outline a thorough set of practical strategies that governments could consider and adopt to promote access and equity related to these services, ultimately resulting in improved fulfillment of social security needs for a diverse array of populations:

1. Ensuring that policymakers and program developers are envisioning and empathizing with a wide array of people's experiences and lives is crucial. This involves taking into account generational variations in technology usage, access to technology, and both digital and social inclusion [35]. The design and execution of policies must rely on 'inclusive co-design', which identifies the varied needs and priorities of diverse groups, including women, individuals with disabilities, and Indigenous communities, among others [3]. To facilitate this approach to policy-making, it is essential for service delivery agencies to possess the necessary resources and skills to engage meaningfully and empathetically with a diverse clientele [36].
2. Funding for digital literacy initiatives aimed at individuals who are currently offline is essential. Providing access to affordable, customized training programs in digital literacy and social support that are available at no cost will be crucial in helping those not yet online to connect and utilize these services with regularity and confidence [36].

3. Assistance in financing the acquisition of digital devices is essential. Individuals could benefit from grants, subsidies, or long-term, interest-free loans to facilitate the purchase or enhancement of digital technology, enabling them to access and maintain their engagement with government online service processes [37].
4. Collaborations with groups that are especially vulnerable or difficult to access are essential [4]. By investing in co-design efforts involving seniors—especially indigenous elders, women, and individuals with disabilities, the homeless, and those impacted by substance abuse—outcomes for these communities will be enhanced [38].
5. From the outset, it is essential to make certain that digital solutions are both 'user-centered and user-driven [5].' To inform the design, development, and delivery of services, government and service providers should employ a wide range of methods to engage with the individuals utilizing their services and support [39].
6. To foster trust and address concerns regarding privacy and security, it is essential to provide transparency about platform performance and the supply chain. The government must create standardized criteria and evidence-based measures aimed at safeguarding user privacy and security [39].
7. It is essential to engage and collaborate with the individuals most impacted by social security services to gather insights and evidence to create and evaluate system models and templates that address their concerns [6]. Building trust-based relationships with people from various backgrounds—rural or urban, metropolitan or suburban, different ages and abilities, educational experiences, and local or international contexts—was among the key factors contributing to the success of their strategy [40].

5 Conclusion

The potential of technological innovation to improve social security services is enormous. Technological innovation can help improve service delivery within public administrations by increasing efficiency and reducing costs, while enabling higher levels of service quality. It must also ensure that such innovations are inclusive. To ensure inclusiveness, universal access must be offered to all populations—equal access, which is not without its challenges, but is indeed a very worthwhile endeavor. There are also many great opportunities to ensure inclusiveness, and stakeholders are encouraged to seize every opportunity to address issues and support these opportunities to achieve the broader perspectives known for taking action. Achieving inclusiveness requires ongoing communication with all parties involved in the inclusiveness effort about the strategies used at different times and in different circumstances. This includes new technologies that are constantly evolving service delivery, and regular assessment of whether they are making sufficient progress in making social security services accessible to all. In addition, it requires ensuring that progress has been made appropriately in the provision of social security services, through the need for periodic assessments necessary to confirm that we are ensuring safe steps taken into

account related measures involved aspects of the active role played by the engaging participants. Indeed, seeking to ensure that inclusiveness is realized in the technological development of social security services is a worthy goal, but the challenges are enormous. The challenges represent the current state of technological integration within social security services and it is not enough to simply recognize the potential associated with inclusiveness. True equitable inclusion can only be achieved when those responsible for delivering these services recognize these challenges and relentlessly strive to ensure that they are contributing factors to eliminating them. The way forward towards making real change in social security services lies in adopting innovative solutions while also addressing the existing realities of technology. Ideally, the benefits associated with innovation and inclusiveness outweigh the efforts required to overcome these challenges. Technology should ideally be used to connect individuals around the world while creating new opportunities for people everywhere. Despite how disruptive the dynamics of technology can seem, an emphasis on inclusiveness ensures that loss is not the only outcome. The risks of technological advancement do not overshadow the benefits of increased access to social security services. A future that fosters greater equality in service delivery would greatly benefit both individuals and economies around the world.

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Legal Frameworks for Protecting Consumer Rights in E-Commerce: A Digital Age Perspective



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Abstract This research investigates the legal issues surrounding misleading online advertising, focusing on its effects on consumer rights. It assesses how existing laws tackle electronic advertising and evaluates their success in combating false and deceptive advertisements. Through an examination of pertinent regulations in both nations, the research identifies an urgent necessity for law updates and improved oversight to guarantee adequate consumer protection. Additionally, the study underscores the significance of refining dispute resolution processes and clarifying consumer rights, along with boosting awareness and training initiatives for businesses and consumers alike. Drawing from these insights, the research offers a series of recommendations aimed at enhancing the legal and procedural framework for addressing deceptive advertising, which includes revising legislation, fortifying oversight, and establishing dispute resolution systems, all contributing to a more secure and transparent e-commerce landscape.

Keywords Consumer protection · E-commerce · Legal framework · Digital age · Legal guarantees · Digital challenges · Legal reforms · Digital environment · Consumer rights · Digital E-commerce

1 Introduction

In most legal systems, consumers are granted protections through established frameworks that take into account the distinct characteristics of online shopping and transactions with e-commerce retailers. They possess the right to obtain truthful information regarding products and the ability to initiate legal action in instances of fraud or deception. The purpose of this legislative framework is to foster a transparent

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and equitable commercial atmosphere while building trust between consumers and merchants.

The rise of e-commerce and the increase in online retail outlets have led to many cases of imitation of products and brands, highlighting the need for safeguarding online stores. Laws are in place to protect e-commerce businesses from infringements and unfair competition. This chapter will examine these matters, concentrating on both civil and criminal protections available to consumers shopping in online stores.

1.1 Study Objectives

This study aims to achieve the following objectives:

1. Analyze the rights of electronic consumers in e-commerce transactions under Jordanian and Emirati law, compare these rights with the rights of consumers in traditional trade and highlight the differences between them.
2. Assess the effectiveness of legal provisions protecting consumers from false and misleading advertising in online stores, analyzing the impact of current legal safeguards on consumer safety and trust in e-commerce.
3. Identify the shortcomings of current regulations on electronic consumer protection.
4. Examine how manipulation and fraud in e-commerce exploit consumer rights.

1.2 Study Methodology

This research utilizes a descriptive and analytical approach to evaluate the protection of consumer rights in e-commerce. It involves the collection and analysis of data from legal documents and various sources, along with a review of pertinent literature. To identify challenges and gaps in consumer protection within the digital landscape, content analysis will be employed to scrutinize the current laws and regulations.

2 Consumer and E-Commerce Store Protection

In e-commerce transactions, consumers retain the same status as they do in traditional contracting; however, the distinction arises from the electronic means of interaction. Consequently, it can be asserted that consumers enjoy all the rights and privileges afforded to those in conventional commerce, while also needing to account for the specific characteristics of the electronic medium utilized for contract execution [1]. For consumers, trust in agreements made through online platforms is essential for addressing their individual needs. Legal safeguards for consumers are crucial, as they often represent the weaker party in these transactions. In such scenarios, a consumer

may require a vital good and could find themselves facing unusual and inequitable terms. Given that the seller typically holds a stronger position in the contract relative to the consumer, this protection is necessary on both international and national levels. The pursuit of quick profits has led numerous traders to engage in illegal practices aimed at rapid financial gain through various fraudulent and deceptive schemes. Therefore, the necessity for civil and criminal protections for consumers becomes clear [2].

2.1 Rights of the Electronic Consumer

Given the multitude of infractions and misleading advertisements, coupled with the dangers they present, consumers are exploited by advertisers and store owners into entering agreements, capitalizing on the unavailability of the product or service at that moment. Consequently, creating a secure environment for consumers and safeguarding their rights and benefits is crucial.

According to Article 3 of the Consumer Protection Law,

A. **The consumer is entitled to** [3]

1. Receive goods or services that fulfill their intended purpose without endangering their interests or health during typical or anticipated use.
2. Access clear and precise information regarding the goods or services they intend to purchase, as well as the terms of sale.
3. Obtain comprehensive and transparent details prior to finalizing the purchase about the rights and obligations of the provider.
4. Select the goods or services they wish to acquire without facing undue pressure or unreasonable restrictions.
5. Acquire proof of purchase along with the key details of the transaction.
6. Initiate legal action for any infringement of their rights or damages, including pursuing fair compensation for any harm incurred.
7. Receive complete and accurate information about the provider and their location.

B. **The provider is forbidden from engaging in any actions or omissions that result in a violation of consumer rights** [4]

In Article 4 of the Federal Law on Consumer Protection, the UAE legislator similarly delineated consumer rights, which encompass:

C. All obligations established under this law are considered consumer rights, including:

1. Ensuring a safe and suitable environment during the purchase of goods or receipt of services.
2. Obtaining accurate information regarding the goods or services being acquired or utilized.
3. Informing and educating consumers about their rights and responsibilities.

4. Exercising the choice of the most appropriate product or service available in the market based on individual preferences.
5. Safeguarding the privacy and security of their personal data, prohibiting its use for promotional or marketing purposes.
6. Honoring their religious values, customs, and traditions in the provision of any goods or services.
7. Receiving just compensation for any damages resulting from the purchase or use of goods or services.
8. All other rights stipulated by the relevant legislation in the country. The Council of Ministers may also introduce additional rights" [5].

From the information presented, it can be concluded that consumers possess a variety of rights and privileges, among which is the right to information. This particular right obligates the seller to furnish all relevant details that aid the consumer in determining whether to engage in a contract [6]. This entails providing the consumer with information regarding the product's price and key attributes, allowing them to make an informed decision with assurance, free from any deception or fraud by the seller, and ensuring they receive the product as advertised [4].

The Consumer Protection Law provides consumers with the right to pursue legal action and initiate a lawsuit in response to any violation of their rights or damages. According to Article 3/A/6 of the Consumer Protection Law, "The consumer has the right to file lawsuits for any infringement of their rights or damages, including seeking fair compensation for harm caused" [7].

The researchers hold the view that consumers are entitled to this right when their rights are infringed upon, as supported by the Consumer Protection Law and fundamental contract principles. This right extends to electronic consumers, since the legislation does not omit them from such protections. For example, if an individual purchases a weight-loss product from an online retailer and discovers it to be ineffective, that buyer is entitled to pursue legal action, file a lawsuit, and seek appropriate compensation for any damages incurred from the product's use.

Consumers possess the right to think and make choices, a right that guarantees they can make informed decisions without any undue pressure. The legislator has established that consumers are entitled to select goods or services without coercion. This entitlement can put an end to the prevalent behavior of certain providers who withhold contract models from consumers until after they have signed, thus denying them the chance to examine the terms of the contract in advance [8].

The researchers assert that the ability to choose and think is in harmony with the idea of authentic consent when establishing a valid will prior to engaging in a contract with another party. Moreover, consumer rights encompass the safeguarding of customer data and privacy. This implies that no personal information, details about private life, or financial data should be revealed or utilized for reasons beyond the restricted timeframe required for the business activities or transactions undertaken by the consumer [2].

The Internet acts as a showcase for various products and services from online retailers, presenting them in a virtual, intangible environment. This creates a gap

between consumers and store owners, as the latter possesses comprehensive knowledge about the products and services. Consumers only access this information after entering into a contract, and traders exploit their need for these products by capitalizing on the fact that consumers do not physically possess them. Such circumstances highlight the necessity for consumer protection. Given the supplier's advantageous position in the contract and the consumer's lack of experience and expertise, safeguarding consumers in electronic transactions is essential due to the distinctive nature of these agreements. Consumers are unable to ascertain the true characteristics and specifications of the products, often lacking adequate information about what is offered online. Hence, legal measures are required to shield consumers from deception, fraud, or any actions that could undermine their consent [9].

The rise of e-commerce has elevated the role of online retailers, which now provide an extensive array of services such as real estate, tourism, and banking, alongside the sale of goods. Consumers are driven to seek electronic services due to the accessibility of high-quality products and services at competitive prices. The surge in online stores and the heightened competition among them to deliver optimal offerings to consumers, coupled with outstanding after-sales support, motivates individuals to engage in contracts with these retailers [10].

In e-commerce agreements, consumers do not have physical access to the product or service, which makes them vulnerable to negative advertising tactics employed by the provider. These methods can influence consumer choices and lead to online purchases that they may have avoided had they been aware of the accurate details regarding the product. To safeguard consumers from these dangers, it is essential to implement measures that protect them from succumbing to consumerist impulses [10].

Additionally, it is clear that most legislations fall short in providing adequate legal protections for the interests and rights of electronic consumers when interacting with online retailers. Unlike traditional transactions, e-commerce deals possess distinct characteristics. Due to their limited understanding of the products involved in contracts, electronic consumers find themselves more susceptible to fraudulent schemes and misleading advertisements. The absence of targeted legal measures for electronic consumers has resulted in a rise in deceptive practices, leading individuals to enter into agreements they would have avoided had they been fully informed about the specifics of the product or service.

3 Consumer Protection Frameworks in Online Stores

One of the primary necessities for consumers to fulfill their personal needs is trust in contracts established through online retailers. Given that consumers can often find themselves in a disadvantaged position during these transactions, legal safeguards are crucial. In instances where essential goods are required, they may encounter unfair and burdensome conditions, with the seller holding a more powerful position in the agreement. This consumer protection is vital at both national and international levels.

The pursuit of quick profits has prompted numerous traders to resort to illegal tactics for swift financial gain, employing various forms of fraud and deceit. This situation highlights the significance of both civil and criminal protections for consumers.

4 Legal Protection for Consumers and Its Means

Legislators needed to establish a sense of comfort and confidence for consumers shopping at online stores and engaging in contracts, ensuring their rights were clearly defined and protected in instances of infringement [11]. By referencing overarching principles, it can be stated that consumers possess various methods to assert their rights, which include the following:

4.1 Claim for In-Kind Execution

When a consumer engages in a contract, the fundamental principle is to meet the obligations that arise from that agreement as both parties have consented. Nevertheless, if the consumer realizes they have been misled by false advertising—whether the advertiser does not provide what was promised or delivers a defective product—the consumer has the right, according to general principles, to file a claim for in-kind execution against the advertiser, seeking the delivery of the product as specified in the advertisement [12].

According to Article 3/A/6 of the Consumer Protection Law in Jordan, "the consumer has the right to file claims for any actions that may violate their rights, harm them, or restrict them, including claiming fair compensation for damages incurred as a result [13]." This grants consumers the authority to pursue legal action in court against any party that infringes upon their interests or breaches their legally protected rights. To prevent misleading advertisements that could lead to legal penalties, both Jordanian and UAE lawmakers mandate that suppliers must provide precise and truthful information regarding the products they advertise. Article 6/A/3 of the Jordanian Consumer Protection Law outlines the criteria for determining whether a product is defective, which includes failure to conform to the advertised specifications. Additionally, it states that providing incorrect information to consumers prior to the contract, as well as withholding certain information and obligations, constitutes a breach of contract by the other party. Specifically, it asserts, "the product or service is considered defective in any of the following cases [14]:

– Failure to match the advertised characteristics or not achieving the results promised to the consumer.

According to Article 17 of the Federal Consumer Protection Law in the UAE, it is forbidden for advertisers, suppliers, and commercial agents to present a product or

service with false information or deceptive advertising [15]. In a similar vein, Article 4 of the Jordanian Consumer Protection Law mandates that suppliers must [16]:

- Guarantee the quality of goods or services as advertised and their appropriateness for intended use or consumption.
- Ensure that the characteristics of goods or services correspond with what was advertised and deliver the promised outcomes to consumers.
- Provide the product or service to the consumer within the agreed timeframe or the customary timeframe without any delays.
- Supply products that do not violate intellectual property rights. E. Honor religious values, customs, traditions, and the dignity of consumers [17].

This article states that if a supplier delivers an item that differs from what was advertised, they are contractually responsible. As a result, consumers can insist that the supplier meet their obligations without incurring any burdens or costs, which may include repairing the item, replacing it, re-providing the service, or issuing a refund. Article 3 of the same law grants consumers the right, based on general principles, to pursue legal action for fair compensation for any damages arising from violations of their rights, whether the contract is executed or terminated.

According to Article 7 of the Consumer Protection Law, the Jordanian legislator mandates [18–21]:

- If a product is found to be defective, the supplier must return it and refund its price upon request from the consumer or anyone to whom the product's ownership has been transferred [22–25].
- If a defect emerges after the consumer has utilized the product, the supplier is required to compensate the consumer for the damage incurred [26–28].
- If a service is deemed defective, the supplier must refund its price upon the consumer's request if the service has not been provided or if the supplier is able to retract the service. Should a defect manifest in the service after the consumer has fully received it, the supplier is obligated to compensate the consumer for the damage incurred.
- Regardless of the stipulations in paragraphs (A) and (B) of this article, the supplier may, with the written consent of the consumer, correct the defect that caused the issue in the product or service [29].

Under the principles of civil law, consumers possess the right to initiate a lawsuit for specific performance, compelling the advertiser to meet their obligations as outlined in the commercial advertisement. Additionally, if the advertiser declines to fulfill their duties, consumers may seek to terminate the contract while still retaining the right to compensation in either scenario. Article 246/1 of the Civil Code articulates, "in bilateral contracts, if one party fails to fulfill their contractual obligations, the other party may, after notifying the debtor, request in-kind execution or termination of the contract" [30].

The researchers are of the opinion that consumers have been granted legal safeguards by the legislator, who permits them to file a claim for specific performance. This compels advertisers to meet their obligations and also allows consumers to

request the termination of the contract and return defective items. Consequently, the ability to claim in-kind execution offers essential protection to consumers engaging with online retailers against deceptive advertising practices. This stems from the advertiser's understanding that the law mandates adherence to the claims made in their advertisements, thereby ensuring that they provide truthful information about the product being promoted to avoid the offense of misleading advertising. Such empowerment allows consumers to challenge the advertiser, and if only part of the contractual obligations can be fulfilled, the consumer has the choice to either insist on completing the remaining obligations or terminate the contract while seeking compensation in both scenarios [31].

For instance, if a customer orders a significant amount of cosmetics from an online retailer and, when the delivery date arrives, only half of the order is in stock while the remainder is unavailable, the buyer can choose to either complete the order or cancel the contract with compensation.

4.2 Claim for Compensation

Compensation is characterized as "a means of repairing harm, specifically aimed at remedying rather than completely erasing the damage that has occurred [32]." Consequently, under legal provisions, a consumer who suffers from misleading advertising is entitled to seek compensation for any damages incurred, whether they are material, moral, or both. The Jordanian Consumer Protection Law allows consumers to file lawsuits to claim compensation for harm resulting from violations of their legally protected rights. It is firmly recognized that consumers possess the right to receive all pertinent information regarding the advertised product. Therefore, any infringement of these rights and obligations subjects the advertiser to legal action, resulting in compensation for the consumer's interests [33]. According to Article 6/A/3 of the law, "the consumer has the right to file claims for any actions that may violate their rights, harm them, or restrict them, including claiming fair compensation for damages incurred as a result" [34].

The researchers assert that consumers are entitled to pursue compensation for any direct harm resulting from deceptive and false advertising, regardless of whether the harm is physical or emotional.

4.3 Claims for Deception and Gross Disparity

To enable consumers to make informed choices about products or services, advertisements need to exhibit a significant level of credibility and transparency. According to Article 3/A of the Consumer Protection Law, consumers are entitled to select products freely, without coercion or limitations on their freedom of choice, relying

on accurate information to ensure that their decisions reflect their true preferences [35].

It has been observed that certain merchants engage in deceptive advertising tactics to lure consumers and convince them to enter into agreements they would not have accepted had they been aware of the actual nature of the product. As outlined in Article 143 of the Jordanian Civil Code, deception is characterized as "when one party misleads the other through fraudulent verbal or physical means, resulting in their agreement to something they would not have consented to otherwise" [36].

According to Jordanian Civil Law, mere deception does not inherently indicate a flaw in consent unless it is coupled with gross disparity. For a consumer to pursue a claim involving deception and gross disparity, several criteria must be fulfilled. The seller must engage in fraudulent practices, the deception must be the motivating factor behind the consumer's contract, and this deception must lead to gross disparity. Therefore, the consumer's decision to enter into a contract must be driven by the use of deceptive methods or misleading advertising. Not every falsehood impacts the consumer's will or corrupts their consent. There exists a notion of acceptable or permissible deception in customary practice, where reasonable exaggeration in promoting the advertised product does not qualify as deception [37].

The judge evaluates deception not by assessing the degree of misleading tactics aimed at the contracting consumer but by applying an objective standard that reflects the average consumer's awareness and perception. In legal terms, advertising is deemed deceptive if the necessary conditions for filing a claim are satisfied, meaning the deception must be connected to and stem from the advertiser. Furthermore, an online store owner cannot be held liable for deception unless it can be shown that the merchant was aware of the misleading information and chose to hide it. This is outlined in Article 148 of the Civil Code, which states: "If the deception originated from a non-contracting party and the deceived party proves that the other contracting party knew of the deception at the time of the contract, the deceived party may annul the contract [38].

In instances where deception intertwines with significant inequality, consumers misled by deceptive advertising can seek reparations for any damages incurred from the contract [28]. This is because the advertiser employed unlawful fraudulent tactics that compelled the consumer to consent to terms they would not have otherwise agreed to. While a claim for deception necessitates the presence of misleading practices, compensation itself does not hinge on gross disparity [39].

The researchers posit that when a seller embellishes the merits of an advertised product within acceptable boundaries, it does not amount to deception. Conversely, if deceitful tactics are employed that lead to a contractual agreement with the consumer and create significant imbalance, the buyer is entitled to pursue a claim for deception along with gross disparity [27]. For example, if an individual purchases an expensive watch from an online retailer that claims to represent a reputable brand, only to later discover it is a counterfeit, the inquiry will center on the seller's fraudulent practices and whether the deception resulted in gross disparity, thereby validating the claim. Should the deception lack accompanying gross disparity, the consumer may seek restitution for any damages incurred [40, 41].

4.4 Criminal Protection for Consumers

A legal approach to safeguard consumers against deceptive commercial advertisements involves assigning criminal liability to the advertiser when the necessary components of the offense are present. This encompasses the material aspect, characterized by fraudulent tactics or deceit that can mislead consumers, as well as the moral aspect, which indicates that the advertiser had the intention to deceive and mislead the consumer through the advertisement [26, 30, 42].

The Consumer Protection Law falls short in providing adequate criminal safeguards for consumers. It fails to broadly criminalize numerous fraudulent business practices and does not impose identical penalties on the perpetrator, accomplice, and instigator. Additionally, there is no requirement for the disclosure of judgments against the service provider. In contrast, the French legislator has incorporated a penalty for publishing judgments in Article 125 of the French Penal Code (1993), utilizing methods including posting, as well as written, spoken, or visual media [31, 43, 44].

The researchers note that one of the most impactful penalties for the convicted party is the publication of the judgment, affecting both individuals and entities involved in consumer-related offenses. When a judgment is made public, it damages the reputation and standing of the online store in the eyes of consumers, serving as a considerable deterrent since transactions rely heavily on consumer trust. Should this trust be eroded, the online store risks losing its customer base and market presence, resulting in diminished confidence and fulfilling both general and specific deterrence objectives.

Contemporary laws generally impose sanctions on individuals who breach consumer data privacy, engage in electronic intrusion, or forge electronic documents pertaining to consumers [11]. The punitive framework for crimes related to consumers encompasses various elements, including limitations on judicial discretion when determining penalties. One significant limitation is the ban on combining penalties for multiple offenses committed by a single individual, as specified in the overarching regulations. Although a judge may seek to consolidate penalties, this does not apply to offenses involving consumers. The Economic Crimes Law of Jordan explicitly states this in Article 4/C: “The court may not use discretionary mitigating reasons to reduce the penalty below the minimum prescribed for any of the crimes listed in Article 3 of this law.” This provision pertains to economic offenses such as fraud involving goods, illegal speculation, and bankruptcy, and it establishes that penalties for multiple offenses cannot be consolidated under this legislation [12, 34].

An additional limitation involves penalizing instigators and accomplices with identical consequences as those faced by the primary offender, as articulated in Article 27 of the Electronic Crimes Law: “Anyone who deliberately participates, assists, or instigates the commission of any of the crimes specified in this law shall be punished with the same penalty as that for the perpetrators.” This concept is

further elaborated in Article 4/D of the Economic Crimes Law: "The instigator and accomplice are punished with the same penalty as the main perpetrator" [34, 45].

The heightened penalty for multiple infractions constitutes the third restriction. According to Article 2/B of the Consumer Protection Law, it is stated that "in cases of repeated violations, the court may impose a permanent or temporary ban on the provider from participating in the activity related to the violation.

The Consumer Protection Law in Jordan has been given priority status for cases related to consumers, as specified in Article 23: "Competent courts prioritize civil and criminal cases concerning consumer protection that arise under this law, including the enforcement of their judgments" [14, 46]. To safeguard consumers against price manipulation by advertisers, Article 14 of the Federal Consumer Protection Law requires that advertisers comply with the content of their advertisements and prohibits selling products at prices exceeding those advertised, with fines for violations ranging from 100,000 to 2,000,000 dirhams [6].

According to Article 25 of the Consumer Protection Law, the Jordanian legislator states: "Anyone who contravenes any provision of this law or the regulations enacted under it shall face a penalty of a fine ranging from a minimum of 250 dinars to a maximum of 10,000 dinars, or imprisonment for a duration not exceeding six months, or both penalties, unless a more severe punishment is stipulated in other relevant legislation. B. For repeated offenses, the court has the authority to either temporarily or permanently prohibit the provider from continuing the activity related to the violation" [16, 26–28, 44].

The analysis conducted by the researchers reveals that the penalties outlined in the Consumer Protection Law have been effectively revised by the UAE legislator, resulting in increased fines for violators that now range from 100,000 to 2,000,000 dirhams. Additionally, there is a possibility of doubling the penalty for repeat offenses within a year, showcasing the UAE legislator's dedication to consumer protection and the prevention of deceptive advertising. Conversely, the Jordanian legislator has not adequately tackled criminal protection, as evidenced by the relatively low penalties that fail to offer sufficient deterrence. This situation may lead advertisers to persist in misleading practices. The researcher expresses hope that the Jordanian legislator will reassess and enhance penalties to more effectively safeguard consumer rights and establish a stronger deterrent for traders [17].

5 Conclusion

To sum up, safeguarding consumer rights in the realm of e-commerce is an essential and important concern, especially in light of the swift technological progress and the growing trend of online shopping. The prevalence of deceptive advertisements in online retail presents a considerable challenge that necessitates robust legal measures from regulators in Jordan and the UAE. The research indicates that although existing laws have achieved certain advancements, additional progress and revisions are necessary to align with the evolving e-commerce landscape. To enhance legal

safeguards for consumers against deceptive advertising, it is essential to take actionable measures, which involve refining legal documents and ensuring their effective application, along with boosting consumer knowledge regarding their rights and methods to authenticate advertisements.

5.1 Findings

The study concluded the following results:

1. In electronic transactions, consumers are entitled to essential rights such as access to clear and accurate information, protection of their privacy and security, as well as the right to receive a refund if they encounter problems with products or services.
2. Existing legal frameworks in Jordan and the UAE offer a satisfactory degree of protection against deceptive and misleading advertisements; however, enhancing law enforcement and establishing effective monitoring systems is essential for ensuring proper implementation.
3. The research uncovered deficiencies in existing laws, including insufficient specifics in e-commerce regulations and ambiguous rules regarding deceptive advertising, resulting in some online retailers taking advantage of these loopholes.
4. The research proposed changes to legislation aimed at strengthening consumer rights and safeguarding individuals against fraud and deceit by implementing more efficient complaint processes and dispute resolution methods.
5. The research indicated that although existing legal structures provide some level of protection, improved coordination between civil and criminal legislation is necessary to guarantee thorough safeguarding for consumers shopping online.
6. The research emphasized that contemporary technologies, including artificial intelligence and big data, are becoming increasingly important in safeguarding electronic consumers by advancing fraud detection methods and bolstering security measures.

5.2 Recommendations

1. Revise laws concerning e-commerce and advertising to align with recent advancements in the industry and to offer sufficient safeguards for consumers.
2. Strengthen oversight systems for online retailers to guarantee adherence to regulations and standards by creating or refining dedicated regulatory agencies for e-commerce.
3. Establish a robust dispute resolution framework for consumers and online retailers that includes a straightforward and rapid complaint submission process, as well as efficient legal procedures to tackle issues concerning misleading advertisements.

4. Integrate updated consumer rights into existing laws, including the right to refunds and transparent electronic security measures, to provide thorough protection for all online transactions.

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Fertility Support of PCOS with Machine Learning



M. Xavier Suresh, R. Ganeshan, Aditi Babar, Ashraf Shaqadan, and Khaled Sabarna

Abstract Polycystic ovary syndrome (PCOS/PCOD) is a problem in which a woman's hormones are out of balance PCOS increase serious complications among females this is why it is called polycystic ovary syndrome. PCOS is an alarming endocrinopathy. Undiagnosed PCOS can lead to infertility. One in every 5–6 female is facing serious complications regarding infertility and irregularity in their menstrual cycles this endocrine disorder affects females under 18–44 age. Globally it affects 5–15% of females. Early detection of PCOS can help to reduce complications. Thus, in order to reduce difficulties, an accurate and timely PCOS screening system is crucial. Machine Learning (ML), with its capacity to extract features, performs exceptionally well in assessment, patterns and analysis techniques. As a result, a lot of research has been done to use ML to detect PCOS. The techniques of PCOS

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involves the application of several machine learning techniques, including Convolutional Neural Network, Support Vector Machine, K-Nearest-Neighbors, Random Forest, Logistic Regression, Decision Tree, Naive Bayes, etc. The hybrid model demonstrates an accuracy rate of 90.01% in detecting PCOS at its early stages. These findings highlight the potential economic benefits of using advanced ML models in medical diagnostics.

Keywords Polycystic Ovary Syndrome · Machine learning · Random Forest classifier · Health services access

1 Introduction

Polycystic Ovary Syndrome (PCOS) is a complex endocrine disorder that affects a significant number of individuals, particularly those of reproductive age. Hormonal imbalances, a hallmark of PCOS, can significantly impact fertility and overall reproductive health [1]. The prevalence of Polycystic Ovary Syndrome (PCOS) among Indian adolescents is reported to be 9.13%. This underscores the importance of early diagnosis, particularly among adolescent girls [2]. Through the analysis of medical data, artificial intelligence applications improve patient care, tailor treatments, and aid in the diagnosis and management of Polycystic Ovary Syndrome (PCOS) [3, 4].

Some key features of PCOS include:

Menstrual Irregularities: Women with PCOS often experience irregular menstrual periods, which may be infrequent, absent, or heavy.

Ovarian Cysts: The condition is named "polycystic" ovary syndrome because the ovaries may develop multiple small cysts, which are fluid-filled sacs [5].

Hormonal Imbalances: PCOS is associated with higher-than-normal levels of androgens (male hormones) such as testosterone, which can interfere with ovulation and lead to symptoms like acne, excess hair growth (hirsutism), and male-pattern baldness.

Insulin Resistance: Many women with PCOS also have insulin resistance, a condition in which the body's cells do not respond effectively to insulin. This can lead to high insulin levels in the blood, which in turn can increase the risk of type 2 diabetes and other metabolic disorders [6].

Fertility Issues: PCOS is one of the leading causes of infertility in women due to irregular or absent ovulation.

Metabolic Syndrome: Women with PCOS are at higher risk of developing metabolic syndrome, a cluster of conditions including high blood pressure, high blood sugar, abnormal cholesterol levels, and excess abdominal fat, which increase the risk of heart disease and type 2 diabetes [7].

Other Symptoms: PCOS can also be associated with other symptoms such as weight gain or difficulty losing weight, fatigue, mood swings, and sleep disturbances.

The primary objective of this model is to conduct a detailed analysis of cyclical patterns in hormonal levels across menstrual cycles [8]. Key hormones, including

but not limited to LH, FSH, and others relevant to PCOS, will be scrutinized to uncover trends, variations, and anomalies throughout the menstrual cycle. It aims to provide a nuanced understanding of how hormonal dynamics evolve over time [9]. This study is cantered on the detection of Polycystic Ovary Syndrome, a severe hormonal disorder that affects women of reproductive age [10]. PCOS can result in infertility, diabetes, heart issues, endometrial cancer, and other associated health challenges [11]. Detecting PCOS early is vital as it can lead to long-term complications, underscoring the significance of early diagnosis [12].

The system developed in this study can serve as a valuable adjunct tool for physicians in their clinical practice. By offering cost-effective screening, the proposed method ensures that women from low socio-economic backgrounds can also benefit from early detection [13]. This model aims to identify irregularities in hormonal patterns associated with PCOS and provide timely insights for healthcare providers and individuals navigating fertility concerns [14]. Polycystic Ovary Syndrome presents unique challenges in the realm of fertility, often necessitating tailored approaches to optimize treatment outcomes. Although PCOS cannot be cured, appropriate treatment can help alleviate certain symptom. Timely diagnosis plays a critical role in facilitating effective treatment. Diagnosing COS can be challenging due to the diverse array of symptoms experienced by affected women [15].

This model aims to identify the most favourable hormonal conditions for successful treatment, ultimately enhancing the efficiency of fertility interventions and increasing the likelihood of successful outcomes for individuals with PCOS [16]. Polycystic ovary syndrome (PCOS) is recognized as a significant health concern affecting women worldwide [17]. Timely identification and treatment of PCOS are essential for mitigating the risk of long-term complications, including the onset of type 2 diabetes and gestational diabetes [18]. Thus, early and accurate diagnosis of PCOS is vital for healthcare systems to mitigate associated challenges and complications [19].

2 Hormones Effect

Hormone imbalances in certain PCOS-affected women have been reported to include, increased levels of luteinizing hormone (LH), which stimulates ovulation but can have an abnormal effect on the ovaries if levels are too high [20]; low levels of sex hormone-binding globulin (SHBG) [21], a blood protein that binds to testosterone and lessens its effect; these are the three main hormonal changes that women experience; increased prolactin levels, a hormone that encourages the breast glands to produce milk during pregnancy (but only in some PCOS-afflicted women) [22]. Insulin resistance: Being overweight stimulates the body to create more insulin, which causes PCOS symptoms [23, 24]. Insulin resistance can also result in weight gain [25, 26]. The inability of their cells to use insulin correctly is known as insulin resistance, and it affects up to 70% of women with PCOS [27].

Low-grade inflammation: Chronic low-grade inflammation is a common symptom of PCOS patients [25]. Blood tests that evaluate white blood cell and C-reactive protein (CRP) levels can be performed by your healthcare provider to determine the degree of inflammation in your body [27].

Pathophysiology: Studies have also revealed that the pathophysiology of PCOS is mostly related with hyperandrogenism, hypersecretion of luteinizing hormone (LH), and hyperinsulinemia [28, 29]. Women with PCOS have noticeable hyperandrogenism in their ovaries, which causes strong ovarian steroidogenesis. One of the main characteristics is hyperandrogenism, which works in concert with insulin resistance to cause PCOS [30, 31]. PCOS is heterogeneous in nature, and the individual contributions of insulin resistance and hyperandrogenism vary from patient to patient. [32] Medicine is a common part of PCOS treatment [33]. Certain of the recommended medications may be cardioprotective through increased insulin sensitivity and decreased type 2 diabetes risk [34].

3 Materials and Methods

In era of artificial intelligence and data science, machine learning (ML) and ensemble learning have emerged as promising approaches in medical diagnostics. Our research aims to provide model explanations to enhance the efficiency, effectiveness, and trustworthiness of the developed model, achieved through both local and global explanations [35]. We employ various feature selection methods in conjunction with different types of ML models, including logistic regression (LR), random forest (RF), decision tree (DT), naive Bayes (NB), support vector machine (SVM), and k-nearest neighbor (KNN) [36].

This study's PCOS (polycystic ovarian syndrome) data may be accessed at https://www.kaggle.com/prasoonkottarathil/polycystic-ovary-syndrome-pcos. To construct study models, a dataset based on women's physical and clinical characteristics is used. This paper explores the data-driven diagnosis of polycystic ovary syndrome (PCOS) in women, leveraging machine learning algorithms applied to a dataset available on the Kaggle repository.

The dataset includes 43 attributes for 541 women, with 177 diagnosed with PCOS [37]. The dataset presents an uneven distribution of classes. It consists of two files, namely PCOS_infertility and PCOS_data_without_infertility, which have been combined, and redundant columns have been eliminated. [38]. The details of the database features is given in Fig. 1.

Few important aspects that are necessary for PCOS analysis, such as medical history, regular physical activity, BMI, no. of abortions, endometrium, blood group, irregular menstruation, hormone levels (FSH, LH, AMH), and any other PCOS-related characteristics [39]. From the data collected we made many conclusions such as patterns of length of the menstrual cycle, patterns of BMI, patterns of irregularity in menstruation, number of follicles. In order to diagnose polycystic ovarian syndrome using the Kaggle PCOS dataset, classical and ensemble classifiers were

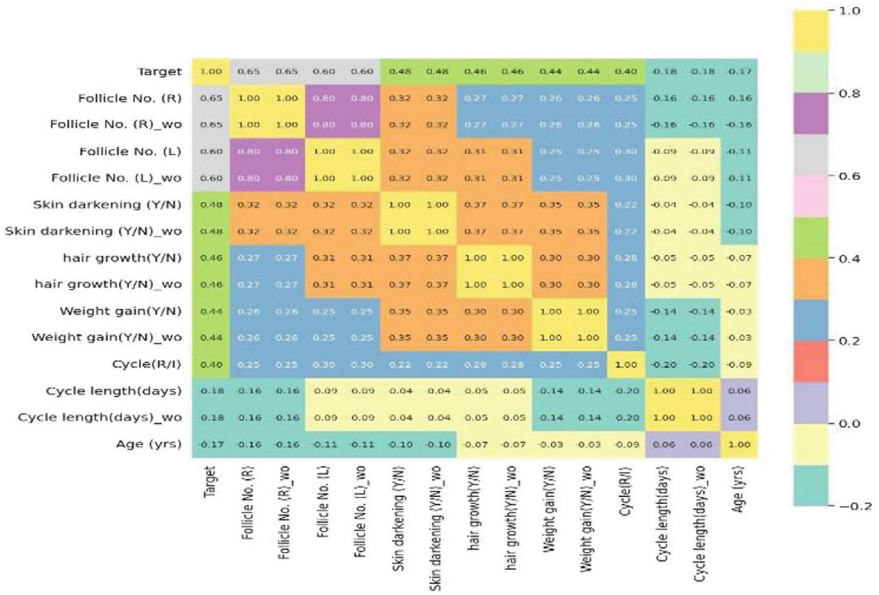


Fig. 1 Correlation matrix

deployed, taking into account the benefits of ensemble classifiers and feature selection techniques [40]. A variety of machine learning approaches, including K-Nearest Neighbor (KNN), Naive Bayes, Decision Tree Classifier, Support Vector Machine (SVM), and Logistic Regression (LR), are used to classify PCOS [41].

We conducted a thorough analysis of AI/ML treatments for PCOS. Every included study was retrospective and observational. The majority of research demonstrated a high degree of accuracy in PCOS diagnosis or "classification" of patients as having PCOS utilizing AI with data from clinical, radiological, electronic health records, or biochemical sources. The area under the receiver operator [42] curve for the eleven investigations that employed standardized criteria varied from 80 to 100% [43]. We used different ML models, namely logistic regression (LR) [42], random forest (RF) [44], decision tree (DT), naive Bayes (NB) [45], support vector machine (SVM) [46], k-nearest neighbor (KNN) [47]. The ensemble model is constructed by aggregating decisions from multiple models to enhance the overall performance of the model. This strategy boosts performance compared to using a single model [48–50]. The given cited table has the best results from the RFLR (Random Forest-Logistic Regression) algorithm. These findings indicate that RFLR achieves the highest testing accuracy of 91.01% and a recall value of 90% when employing 40-fold cross-validation on the 10 most significant features. As a result, RFLR emerges as a suitable option for accurately classifying PCOS patients [51].

Recent studies have demonstrated the high effectiveness of machine learning (ML) algorithms in diagnosing Polycystic Ovary Syndrome (PCOS), with various

models achieving significant success rates. Achieved 92.5% accuracy in early diagnosis using Random Forest and Logistic Regression algorithms [52]. Similarly, [53] utilized XGBoost and KNN algorithms, attaining an 87.3% predictive accuracy [54]. Reported an impressive 94.6% accuracy in PCOS diagnosis through Decision Tree and SVM algorithms using clinical and hormonal data [5, 55]. Developed a prediction model with 91.8% accuracy using Random Forest and Logistic Regression [56, 57]. Provided a comprehensive review of various ML applications in PCOS diagnosis [53, 58]. Evaluated machine learning models based on clinical data, achieving 89.7% accuracy [59]. Additionally, compared different ML models and found that clinical and biochemical data could achieve up to 93.2% accuracy in PCOS diagnosis [57, 60]. These findings underscore the potential of ML algorithms to improve diagnostic accuracy and efficiency in medical diagnostics, leading to earlier and more accurate detection of PCOS, which can enhance patient outcomes and optimize healthcare delivery [61, 62].

4 Results and Discussion

From the data collected we made many conclusions such as patterns of number of follicles, length of the menstrual cycle, patterns of BMI, patterns of irregularity in menstruation as shown in the graph below respectively (Figs. 2, 3, 4 and 5).

The distribution of follicles in both ovaries left and right are not equal for women with PCOS in comparison with the "Normal" people. Following Graph shows the distribution of follicles in women with PCOS. The number of follicles in women with PCOS is higher, as expected. And are unequal as well (Figs. 6 and 7).

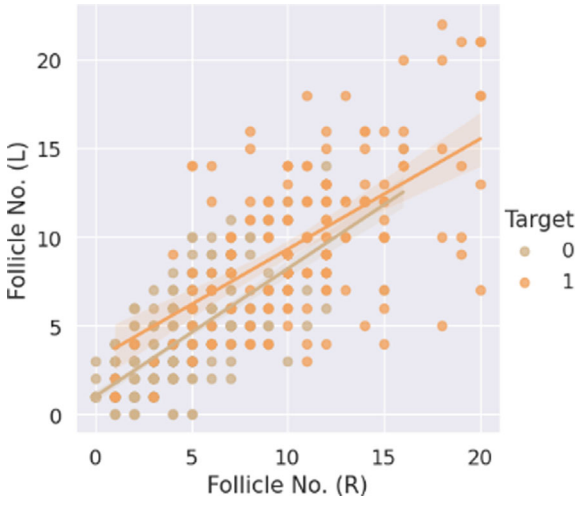


Fig. 2 Pattern of number of follicles

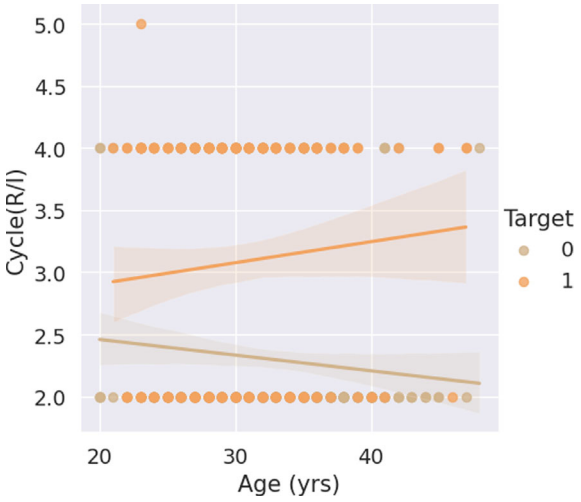


Fig. 3 Pattern of irregularity in menstruation

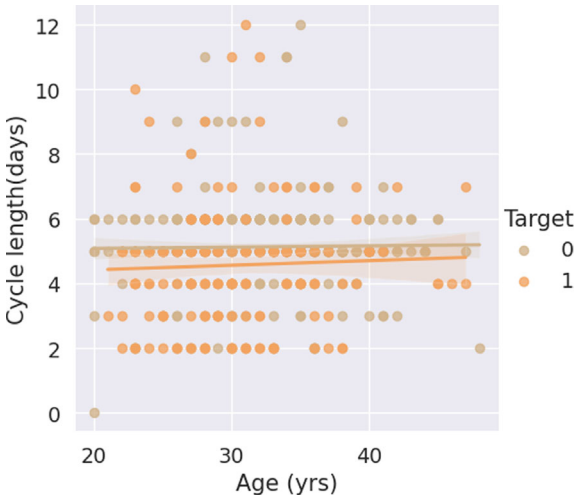


Fig. 4 Pattern of length of the menstrual cycle

The Naive Bayes classifier achieves the lowest accuracy at 76.0%, while the SVM classifier exhibits the longest execution time at 368.2 s.

From this model of the PCOS Detection we get the following conclusion for Logistic regression model: The model performs well for class 0 (the negative class) with high precision (91%), recall (94%), and F1-score (92%). The model performs reasonably well for class 1 (the positive class) with a decent precision (81%) and F1-score (79%), but the recall (76%) is slightly lower, indicating that some positive samples are being misclassified as negative.

Similarly for Random Forest: The model performs well for class 0 (the negative class) with high precision (94%), recall (96%), and F1-score (95%). The model

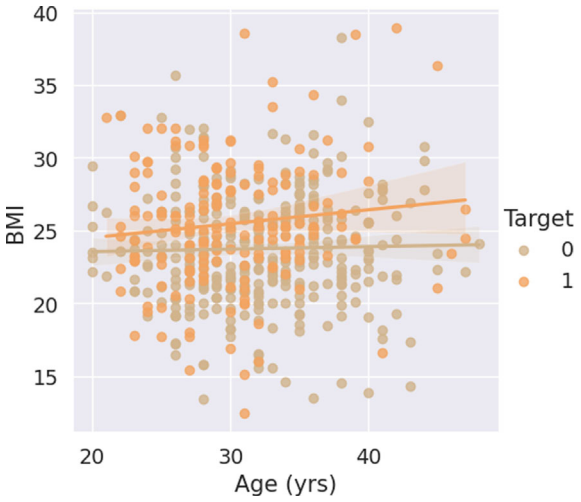


Fig. 5 Patterns of BMI

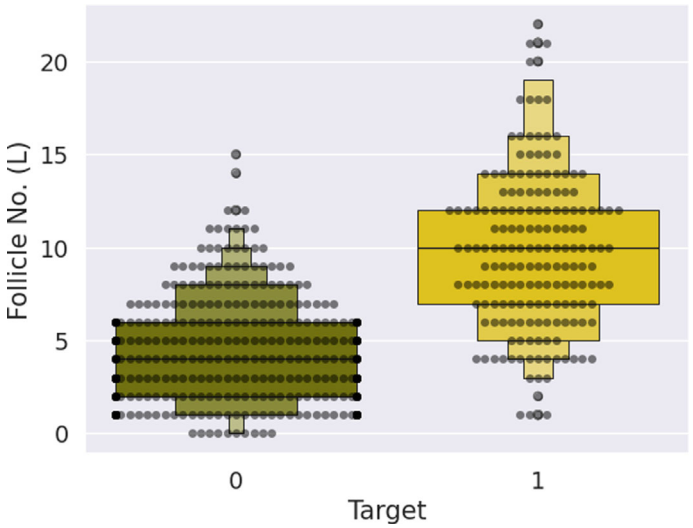


Fig. 6 The distribution of follicles in left ovary in PCOS versus normal women

performs reasonably well for class 1 (the positive class) with a decent precision (90%) and F1-score (87%), but the recall (84%) is slightly lower, indicating that some positive samples are being misclassified as negative (Table 1).

The performance of Random Forest classifier with selected features using splitting 80:20 we get the results of following Roc curve (Fig. 8).

In recent years, machine learning and ensemble learning have emerged as promising approaches in medical diagnostics. Our research aims to enhance the efficiency, effectiveness, and trustworthiness of the developed models through

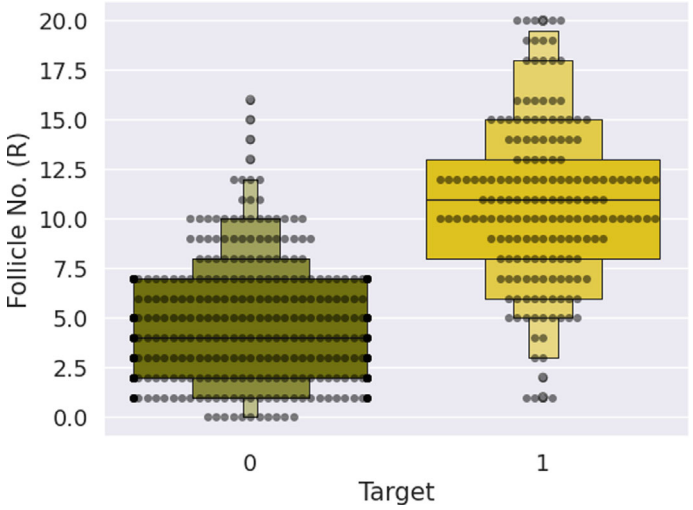


Fig. 7 The distribution of follicles in right ovary in PCOS versus normal women

Table 1 Accuracy and performance matrix of several algorithms in PCOS

Classifier	No. of features	Precision (%)	Recall (%)	Accuracy (%)
Gradient boosting	10	85	85	88.72
	14	85	85	88.72
Random forest	10	88	88	87.99
	14	88	88	87.98
Logistic regression	10	85	85	88.35
	14	83	83	88.35
RFLR	10	89.90	90	90.01
	14	89.20	89.30	89.27

comprehensive model explanations, achieved using both local and global explanation methods. We employ various feature selection techniques in conjunction with different types of ML models, including logistic regression (LR), random forest (RF), decision tree (DT), naive Bayes (NB), support vector machine (SVM), and k-nearest neighbor (KNN). Our performance evaluation reveals that Gradient Boosting consistently maintains a precision and recall of 85%, with an accuracy of 88.72%, regardless of using 10 or 14 features. Random Forest also shows stable precision and recall at 88%, with accuracy around 88%. Logistic Regression, however, exhibits a slight decline in performance when increasing the number of features from 10 to 14, with precision and recall dropping from 85 to 83%, though accuracy remains at 88.35%. The combined Random Forest and Logistic Regression (RFLR) model demonstrates the best overall performance, achieving the highest precision (89.90%),

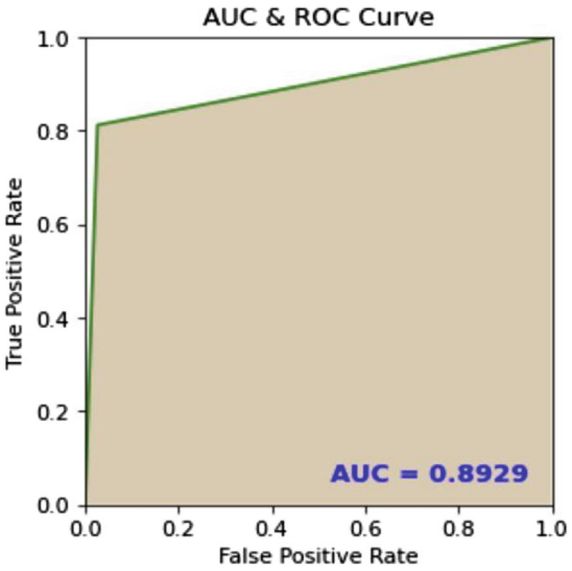


Fig. 8 The AUC and ROC curve

recall (90%), and accuracy (90.01%) with 10 features, though there is a slight decrease in performance with 14 features. These findings indicate that the RFLR model, particularly with 10 features, offers the most robust performance, highlighting the potential benefits of ensemble approaches in medical diagnostics.

By leveraging machine learning techniques in fertility support and PCOS detection, healthcare providers can enhance diagnostic accuracy, improve treatment outcomes, and deliver personalized care to individuals struggling with infertility or PCOS. Additionally, these approaches have the potential to reduce healthcare costs, minimize unnecessary interventions, and alleviate the emotional burden associated with fertility challenges.

5 Conclusion

In conclusion, our paper's primary aim is to develop an early detection model for Polycystic Ovary Syndrome, aiming to mitigate the risk of long-term complications associated with the condition. To achieve this goal, we employ various machine learning techniques to construct the proposed stacking ensemble ML model leveraging machine learning algorithms, including decision trees and nearest neighbours, for fertility support in PCOS datasets holds promise in providing valuable insights and predictive capabilities. The application of these algorithms aims to enhance fertility-related decision-making and support individuals with PCOS in their journey towards conception. The results showed by the Random Forest classifier are recorded

the highest performance compared to other models. It achieved the highest percentages of different evaluations metrices at high precision (94%), recall (96%), and F1-score (95%). These findings highlight the potential economic benefits of using advanced ML models in medical diagnostics. By improving diagnostic accuracy and efficiency, these models can reduce healthcare costs associated with misdiagnoses and unnecessary treatments. Moreover, the enhanced trustworthiness and effectiveness of these models can lead to better patient outcomes, further reducing long-term healthcare expenses. The RFLR model, particularly with 10 features, offers the most robust performance, emphasizing the economic value of investing in and adopting sophisticated ensemble approaches in the healthcare sector.

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The Role of Artificial Intelligence in Modernizing Social Security Systems: Implications for Data Security and Privacy



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Abstract The continuous evolution of technology, particularly artificial intelligence (AI), is transforming the way governments deliver services, including social security systems. This research examines the implications of adopting AI in social security systems, focusing on data privacy and security considerations. The study begins by analyzing the services provided by social security systems and common data security vulnerabilities. It then explores AI's potential to address these weaknesses, highlighting examples of countries that have successfully modernized their systems through AI adoption. The final section assesses the impact of AI tools on data privacy, critically evaluating whether AI can serve as a viable solution to enhance security. The research employs a qualitative methodology, using a descriptive approach to review relevant literature and case studies, followed by an analytical approach to derive insights. The findings emphasize both the benefits and challenges of AI integration, particularly the need for strong data privacy frameworks to ensure the success of AI-driven modernization.

Keywords Artificial intelligence · Social security systems · Data privacy · Data security · Digital transformation · AI-based tools · Public service modernization · Qualitative research · Case studies · Government services

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1 Introduction

The rise of technology has already swept through every industry; from its introduction, artificial intelligence (AI) has steadily gained ground in the provision of government services. Such is the case for social security systems. This research chapter seeks to establish the impact that would come about by fusing AI into social security frameworks with a keen interest in data privacy and security considerations. The chapter first undertakes a detailed exploration of the various services offered under social security systems and preexisting vulnerabilities related to global impacts on many such systems. Afterward, a second part expounds on how AI can play a pivotal role in dealing with these challenges—factors that make the systems vulnerable—by presenting it as an innovative solution toward issues of data security. The same section cites specific examples of countries that have managed to reshape their social security frameworks through successful implementation involving AI technologies. The concluding section assesses the impacts of AI-driven tools on data privacy, which is important to decide whether AI can be a viable solution for the security weaknesses that exist in social security systems.

Social security systems are those institutions that have the mandate to provide essential services to members of the public in areas such as healthcare, pensions and disability or joblessness benefits and income support for families with children or for those who require housing. These systems are dependent on sophisticated technologies—much like other data security-related challenges—that may be exposed to fraud activities like identity thefts and data duplications [1]. In addition to these shared vulnerabilities, many systems worldwide struggle with maintaining organized databases of citizen information along with their service interaction histories, all of which are further compounded by a large number of chapter-based applications that have had to be manually processed. Managed historically at a national level due to the lack of a universal social security number, it has led to duplicated services that bear the ultimate cost burden on social security systems [2].

1.1 Research Significance

The research is important for indicating how artificial intelligence can revolutionize social security systems by dealing with data security and privacy, two vital concerns. Social security institutions are keepers of huge volumes of sensitive data and this makes them susceptible to cases of information disclosure or cyberattacks. However, as AI continues to grow, it has the potential not only to modernize but also secure the systems frameworks. In analyzing the implementation of AI technologies in various countries, this provided valuable information concerning the enhancement of data protection, efficient delivery of services and risks mitigation arising from weaknesses based on traditional insecurities. Moreover, the study adds to the ethical issues regarding the use of AI in public services and provides an overview of how

great the good and bad brought about by technology in a balance. The findings of this research will be very important for policymakers, technology developers and social security institutions in view of the fact that they are in data-led digital transformation landscapes.

1.2 Methodology

This chapter takes a qualitative approach to exploring the contribution of AI towards the modernization of social security systems with special regards to implications on data security and privacy. A descriptive approach is used to review all available literature on this subject, including academic articles, case studies, policy reports and governmental publications. This helps in understanding current vulnerabilities in social security systems' data and what potential AI has for addressing these challenges. It also discusses successful countries that have implemented case examples of AI technology into their social security frameworks. It then applies an analytical approach while interpreting the findings to look for trends and assessing the efficacy of AI-based tools in improving data security and user privacy. This blend of descriptive and analytic approach helps the study to come out with insightful findings about the possibilities of AI in managing security threats, bringing out clearly the ethical and operational difficulties related to these expectations.

2 An Overview of Social Security Systems

Government-led programs and policies that aim to ensure a minimum standard of living for citizens and reduce reliance on welfare are encompassed by social security systems. These systems typically feature benefits for individuals facing sickness or aging, as well as income-related welfare allowances. Social security systems can be categorized into two main approaches: social insurance schemes and welfare support schemes [3]. Contributions in social insurance schemes are utilized to fund benefit costs, which often correlates with higher implicit labor taxes. Conversely, welfare support schemes finance benefits through tax revenues, generally resulting in lower tax rates.

Social security systems have been present in different forms since the early 19th century. The first instance of government-led health and accident insurance was established in Germany as a reaction to the rising income disparities caused by the Industrial Revolution. Meanwhile, the Old Age Contributory Pensions Act, enacted in 1925 in the United Kingdom, marked the initiation of the nation's first statutory social security program [4]. Across various countries, social security systems have evolved distinctly concerning coverage, benefits and financing methods. Typically, these systems have undergone expansions, resulting in complexities and enhancements to existing frameworks. The goal behind broadening social security systems

was to include new categories of workers, such as those who are self-employed or hold non-continuous contracts. Additionally, the rise in job types and flexibility has spurred the creation of new benefits, including maternity leave, childcare allowances and parental leave. The introduction of new eligibility criteria for benefits necessitated further adjustments to employment protection laws and unemployment assistance [4]. In numerous nations, family allowances for the children of workers were established to help diminish income disparities. Initially, these allowances were restricted to low-income families with several dependents, but they were later broadened to address the inequalities in employee income associated with conventional family income factors.

3 Artificial Intelligence in Social Security Systems

Artificial Intelligence (AI) systems exhibit a blend of four key capabilities: perception, cognition, action, and interaction [5]. Meanwhile, Social Security (SS) systems refer to national social insurance frameworks that typically fall under the larger umbrella of the welfare state. The modernization of SS systems can be significantly supported by various AI applications, which also raise considerations regarding data security and privacy. Key technologies to be examined include AI systems for determining candidate eligibility, fraud detection mechanisms, expert systems providing guidance and support to claimants, agent technologies enhancing communication between claimants and SS systems, automated agents aiding in systems integration, assistive technologies designed for the elderly and data mining tools for analyzing administrative information [5]. However, it is evident that AI systems can introduce critical challenges concerning data security and the safeguarding of privacy. For instance, these systems may hinder the ability to detect data breaches and verify adherence to complex data protection laws. Additionally, AI systems could increase both the likelihood and severity of data security incidents. Furthermore, the information utilized by leading AI systems is often extraordinarily sensitive [6]. Lastly, AI systems might restrict the choices available to claimants in ways that are difficult to evaluate. AI systems inherently assume and may exacerbate an unequal bargaining dynamic between individuals whose data is used and a handful of powerful entities. While these systems are generally regarded as significant tools for improving the efficiency, effectiveness, and convenience of SS systems, they also raise concerns regarding data security and privacy protection. The aim of addressing the often unintended consequences of AI is to promote the social acceptability of these technologies; however, it is crucial to examine their effects on data security and privacy when considering their adoption. Focus is directed toward the repercussions of AI systems in four areas closely linked to data security and privacy, emphasizing that these consequences must be addressed when intentional attention is applied to the development and execution of AI systems.

The anticipated benefits of incorporating artificial intelligence (AI) into social security systems are significant, although certain applications may require careful

management. These applications can be categorized into three primary types: direct services, indirect services and data processing. Direct services involve offerings to citizens and beneficiaries [6]. For example, AI can support beneficiaries through chatbots or interactive voice response systems that deliver initial information on topics such as illness, disability, retirement, or maternity, aiding citizens in locating the appropriate fund at the right moment. Another application involves automated voice biometrics, which allow for identification without relying on conventional methods like ID cards, certificates, or social security numbers. This innovation can reduce fraud risks by preventing multiple claims to the same entitlement. Additionally, facial recognition technology can assist children in orphanages and challenging situations by directly connecting them with families seeking to adopt. Indirect services pertain to support for employees within the organization. These services may encompass sentiment analysis applications for surveys conducted with beneficiaries, real-time assessments of complaints gathered from social media, or AI chatbots that solicit information and facilitate e-services, thereby lightening the operators' workload [7]. Analyzing data involves the evaluations typically carried out when handling a vast number of operations and gathering extensive data sets. Within the realm of national social security, predictive, demographic and statistical analyses facilitate the early identification of specific parameters and support informed decision-making. Additionally, network analysis serves as a tool in this domain to combat fraud, abuse and various irregularities. While each of these applications offers numerous advantages, they also introduce risks that must be managed effectively.

4 Data Security and Privacy Concerns in Social Security Systems

For the most part, social security systems globally are highly centralized. Collecting adequate information in a timely fashion was quite challenging prior to the introduction of computers. Nevertheless, with the establishment of instant, reliable, cheap and global communication, data such as social security numbers, identity card numbers, voter ID numbers, driving license numbers and bank account numbers began to be gathered, often centralized at either the state or national level [8]. Fortunately, there was limited acceptance of attempts to gather biometric data, like DNA patterns, for identification purposes [9]. In a functioning democratic state, collecting an individual's data without their consent remains challenging, at least in theory. Conversely, corporations have seamlessly gathered such information as part of their everyday operations, including tracking a customer's internet browsing history. Moreover, the process of electing a political candidate has evolved into a multi-billion dollar endeavor, utilizing undervalued statistics and intelligence to enhance marketing campaigns. Data related to an individual's voting behavior and discussions has been amassed to attract the right audience using psychological tactics [10, 11]. It is widely recognized that power lies in knowledge [9]; the expansion of a business is closely tied

to its understanding of individual customers, often referred to as a loyalty program [12]. In the same vein, social security systems possess sufficient data on centralized platforms regarding the lives of every individual residing in the country, making the democratization of the system already feasible [13, 14].

Even corporations with limited financial resources are utilizing cutting-edge artificial intelligence and contemporary statistical methods to identify each customer, categorizing them either explicitly or implicitly as supporters of political parties and potential purchasers of specific products [15, 16]. The analytical capabilities of these companies significantly surpass those of any government [17]. In some cases, the government even appears willing to foster and endorse these businesses, which operate in direct opposition to governmental interests[18, 19]. This results in a scenario where the law's reach falls short concerning a substantial portion of cyberspace [10, 19]. Furthermore, the issue of privacy and the management of personal data collected by social networks often lies beyond the jurisdiction of most global governments [20]. Meanwhile, there is a troubling rise in frauds stemming from exposed social security information and impersonation attacks, leading to dire consequences [21]. It is crucial to implement appropriate measures to halt this trend before it becomes too late [22]. Significant financial investments will be necessary and any delay could result in irreparable damage. It is crucial to emphasize that a delay of even a single year can render the technical solution and development stage outdated [23]. Therefore, it is essential that research on this subject and its application within the social security systems of all nations occurs concurrently [11, 24].

The modern society's globalization has been evident across various domains, particularly in technology, with advancements in sensors, big data, the IoT and artificial intelligence [25, 26]. Although these technological improvements have significantly accelerated progress in diverse sectors of human society, including traffic, logistics and infrastructure, the abrupt challenge posed by climate change, further exacerbated by the pandemic, has imposed considerable pressures on the developmental paths of numerous regions [12, 27]. The critical advancements in contemporary social security infrastructures have been driven by globalized investment flows, hyper-mobility and the absence of boundaries in financial frameworks [28]. However, many existing social security systems continue to demonstrate outdated processing, administration and organizational delays, rendering them inefficient and unable to meet the demands of a modernized world [29]. By integrating the aforementioned technologies with AI-driven solutions into current social security frameworks, there is potential for significant modernization and enhancement of operational efficiency [30].

In order to protect the interests of all parties involved and enhance the effectiveness of AI-driven solutions for upcoming projects, it is essential to concentrate on several aspects concerning the integrity, security and efficiency of politicians, service providers, companies and citizens during the planning and design phases [13, 32]. Achieving reliability in the anonymization of data and personalization of services is crucial for ensuring integrity and security [33]. To guarantee justice for citizens, political reconciliation must take place. Service providers should be structured to alleviate worries regarding data security, unauthorized access to personal information and the

use of data beyond established boundaries [34]. After data generation, continuous monitoring and auditing of all variables should be conducted at every stage of AI-based solutions to ensure dependable decision-making and immediate access to raw data for each instance [35]. Users must have the ability to set and alter the limits and restrictions on data usage [36]. Clearly defining the rights and boundaries of all parties involved is vital. Prior to initiating development actions, a thorough understanding of society and potential changes in the market and circumstances should be established [14].

Many facets of human activity have raised concerns regarding the application of advanced and AI-driven technologies for gathering, monitoring, and processing personal data in relation to social security decisions and service provision. Issues of discrimination have surfaced, targeting individuals based on age, race, religion, status, gender and orientation. Accessibility challenges associated with hardware and software for the elderly, sick, disabled and uneducated populations could result in the loss of services and entitlements [37]. In addition to the risk of losing rights and freedoms, there are apprehensions about the secure management of stored personal data. It is essential to prevent potential exploitation of raw personal data that could violate human rights, liberties and interests for the gain of commercial enterprises, criminal organizations, unscrupulous politicians, and governmental bodies [15].

5 Regulatory Frameworks

To ensure the ethical and safe utilization of artificial intelligence technologies by social security systems around the globe, numerous regulatory frameworks and best practices have either been established or are currently being developed. These frameworks are designed to guarantee that the creation, implementation and utilization of AI are supported by guidelines that form part of a legal structure based on varying risk categories. The components of the regulatory framework are extensive, incorporating various provisions regarding all dimensions of AI implementation [34]. One important area that this framework places much emphasis on is risk assessment. Risk assessment brings out the aspect of identifying biases, discrimination or any other negative implications that may arise out of the use of AI technologies and stresses the need for assessing the risks comprehensively [38]. This enables policymakers and implementers to mitigate against them effectively. Another major area underpinning this framework is data governance and management [35]; it realizes that the responsible deployment of artificial intelligence begins with proper management and protection accorded to data. Principles on data collection, storage and processing are laid down with specific attention drawn to privacy and security—these ensure protection for individuals' personal information and ethical operation of AI systems. Another critical aspect of the regulations is record-keeping; it demands that, during the development and use of AI systems, specific and accurate records be maintained [39]. This goes a long way in promoting transparency and simplifying auditability and answerability [36]. The maintenance of such detailed records renders the processes

through which AI systems make decisions easily traceable, as well as any possible issues or biases to arise with them. This takes us to another key principle: transparency [40]. The framework stresses providing clear rationales and explanations behind the decisions made by AI. This enables individuals to understand the basis on which artificial intelligence has taken a particular decision, thus allowing recourse in cases of disputes or grievances [37].

The regulatory framework looks to build trust and compliance by making in the execution of AI systems an open practice for transparency. Compliance largely contributes within this framework, as it shapes the standards and channels for organizations and individuals involved in developing and deploying AI systems to laterally comply with the stipulated rules and regulations [38, 41]. Some of what comprises compliance measures could include regular audits, reporting obligations, or even penalties for non-compliance; these are deterrents from misusing AI technologies while promoting responsible use [32]. Despite the many national frameworks on AI governance and ethical standards, they have many challenges: universal applicability and uniformity struggle to keep up with fast-evolving technology [33]. This is only possible through an approach that would be referred to as co-regulation in artificial intelligence development [34–36]. This means that there is a collaboration of both public and private sectors in regulating and steering the development of AI technology sharing in responsibility and knowledge to make sure that AI continues to be in line with societal needs [37–39].

Frameworks for regulation are currently under development. Various stakeholders are engaged in collaborative efforts to create guidelines and resources aimed at promoting the ethical and safe application of AI within government environments [38, 40]. An online repository is being established to compile existing AI policy tools, such as national AI strategies, regulatory frameworks and ethical guidelines [39]. Different governmental entities across multiple countries are joining forces to formulate best practices for AI utilization in the public sector, which now encompasses specific actions [40]. Additionally, numerous organizations and initiatives, spanning from national to international levels, have surfaced to support the ethical and secure advancement and application of AI overall [41].

6 Conclusion

The incorporation of Artificial Intelligence (AI) into social security systems offers unique benefits, challenges, and consequences for upholding strong and secure data privacy measures. Social security systems are essential in humanitarian efforts, contributing to various societal applications of AI, risk forecasting, and technological advancements. These systems protect citizens from a range of threats, ensuring their safety, security and well-being. Nevertheless, as the world evolves rapidly, many extensive technical frameworks supporting prevalent social security systems risk becoming obsolete. Consequently, governments and officials globally face the challenge of updating and modernizing these intricate processes, which often rely heavily

on the protection of individuals' private data and personal information. While integrating AI into widely used social security systems enhances modernization and accuracy, it also necessitates a robust foundation of data privacy practices and safeguards. In a consumer-driven world that increasingly demands a digital presence, individuals encounter numerous choices and decision-making hurdles in their everyday lives. This relentless growth in services is propelled by vast quantities of data that service providers continuously send, receive and analyze to effectively meet user needs. The emergence of the term "big data" can be attributed to the swift expansion of data sets, a variety of analytical tools, communication channels and technical infrastructures. Big data has found social applications across numerous aspects of life, especially within the realm of artificial intelligence, where it places human safety, healthcare and rights in the hands of mathematical algorithms that lack clear accountability. Consequently, the well-being of individuals becomes dependent on the precision and dependability of the technical processes and data that are utilized and shared. As artificial intelligence rapidly evolves and adapts to various societal functions, the diverse roles and responsibilities of social security systems offer clear benefits for the incorporation of these technologies. This discussion includes an overview of the historical development and current experiences, emphasizing the critical importance of risk predictions and their validated advancements. In turn, this leads to an examination of the challenges faced in modernizing this multifaceted social security system. AI plays a significant role at numerous decision-making junctures within the social security framework and there is a focus on specific initiatives aimed at enhancing the robustness and security of data privacy systems, which are essential for the successful integration of technologies throughout society.

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A Study: Future Perspectives of Artificial Intelligence in Complex Health Monitoring



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Abstract The incorporation of Artificial Intelligence (AI) inside the healthcare sector holds the potential to initiate a paradigm shift in the realm of intricate health surveillance. The emerging domains of AI and machine learning (ML) present considerable opportunities for enhancing healthcare services. AI/ML approaches have been incorporated into various domains including medical procedure, healthcare management and scientific research. This research investigates the potential future prospects of AI applications in the field of healthcare monitoring. The study specifically examines how AI can contribute to early disease detection, personalized medicine, remote monitoring, drug discovery acceleration, treatment optimization, and enhanced healthcare accessibility. AI-driven technologies, including ML, natural

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language processing (NLP), and predictive analytics, are significantly transforming the healthcare industry by utilizing extensive datasets to deliver timely, precise, and personalized information. Nonetheless, it is imperative to acknowledge the significance of ethical and privacy concerns, as well as the necessity for continuous education and appropriate deployment, in order to guarantee the effectiveness of artificial intelligence in intricate health monitoring.

Keywords Artificial intelligence · Health monitoring · Natural language processing · Remote monitoring · Machine learning · Health services access

1 Introduction

The healthcare industry is on the brink of a transformative shift due to advancements in Artificial Intelligence (AI) [1]. AI technology holds the potential to revolutionize healthcare by improving disease detection and diagnosis, developing personalized treatment plans, and optimizing administrative tasks, ultimately enhancing patient outcomes [1–3]. AI can analyze vast datasets, identify patterns, and make predictions, thereby increasing the precision and efficiency of healthcare delivery [4]. Recent progress in AI algorithms and access to extensive healthcare datasets have led to new applications, including medical imaging analysis, data interpretation, surgical support, patient record management, and drug discovery [5]. While AI offers substantial benefits, it also presents challenges, such as ethical concerns related to privacy, accountability, and data security [6]. Balancing innovation with patient protection is essential for healthcare professionals, policymakers, and tech developers as they navigate this evolving landscape [7, 8]. This discussion provides a foundation for exploring AI's applications, benefits, and challenges in healthcare [9].

2 Role of IoT in Health care

The Internet of Things (IoT) assumes a pivotal position in the healthcare sector as it brings about transformative changes in multiple aspects, including enhancing patient care, optimizing operational efficiency, and facilitating healthcare delivery [10]. The significance of the IoT in the healthcare sector cannot be emphasized, given its potential to bring about a transformative impact on several aspects of the industry [2, 11]. The IoT is exerting a substantial influence on the healthcare sector, leading to a fundamental shift in the delivery, monitoring, and overall experience of healthcare services [12]. The IoT is exerting a significant impact on the healthcare sector through various important mechanisms:

Remote Patient Monitoring: IoT devices, such as smart watches, wearable fitness trackers, and medical sensors, facilitate the ongoing surveillance of patients' essential

physiological indicators and health measurements [13]. The transmission of this data to healthcare professionals in real-time enables timely identification of health concerns and facilitates a proactive approach to healthcare delivery [14].

Improved Disease Management: Individuals diagnosed with chronic ailments such as diabetes and hypertension can get advantages from the utilization of Internet of Things (IoT) enabled devices, which facilitate the continuous monitoring of their medical status [15]. These devices offer valuable feedback and reminders pertaining to medication adherence and necessary lifestyle modifications [16]. This phenomenon has the potential to enhance illness management practices and mitigate the frequency of hospital admissions [17].

Enhanced Medication Adherence: IoT has the potential to facilitate patient adherence to medication schedules through the provision of reminders and the ability to monitor medicine consumption [18]. The utilization of this approach can prove to be particularly advantageous for individuals who are prescribed intricate prescription regimens [19].

Telemedicine and Virtual Care: The IoT facilitates the implementation of virtual health care solutions and telemedicine, thereby enabling patients to engage in remote consultations with healthcare providers [3, 20]. This holds particular significance for individuals residing in geographically isolated regions or those experiencing restricted physical mobility [21].

Fall Detection and Elderly Care: IoT sensors have the capability to identify instances of falls or atypical activity patterns in older adults, thereby promptly notifying caretakers or healthcare experts in the event of emergency [22].

Enhanced Security and Privacy: The advent of the IoT has brought up a range of security and privacy concerns [23]. However, it also presents promising prospects for enhancing healthcare data security by means of encryption, authentication, and the implementation of secure protocols [24].

Patient Empowerment: IoT devices frequently facilitate the direct transmission of health data to patients, so enabling them to assume a more proactive stance in managing their healthcare and making well-informed choices [25].

Cost Reduction: The promise of the Internet of Things (IoT) to decrease the cost of healthcare in the long term lies in its ability to optimize healthcare operations, enhance patient outcomes, and mitigate hospital readmissions [26, 27].

3 Role of Machine Learning and Neural Network in Health care

Artificial intelligence applications improve complex health monitoring by evaluating enormous volumes of patient data to deliver real-time insights and predictive analytics for improved healthcare results [23, 28, 29]. Machine learning (ML) is a statistical approach that fits models to data and acquires insights through training. As a key branch of AI, ML has gained substantial traction across industries [30]. According to a 2018 survey conducted by Deloitte, 63% of companies actively engaged in AI had incorporated ML into their operations [31]. ML is frequently used in AI methodologies, including precision medicine, which tailors treatment plans to individual patients based on their unique characteristics and treatment context [4, 32]. This requires supervised learning, where training datasets with known outcomes are essential [33]. A more advanced form of ML is the neural network (NN), a technology that dates back to the 1960s and has been extensively used in healthcare research [34]. NNs are effective in classification tasks, such as predicting disease risk, by analyzing the relationships between inputs and outputs through weighted features, although the similarity to actual brain function is limited [35].

Impact of Deep Learning in Health Care

The most intricate manifestations of machine learning encompass deep learning, which refers to the utilization of neural network models comprising several layers of characteristics or variables to forecast outcomes [36]. The quicker processing capabilities of contemporary Graphics processors and cloud infrastructures have facilitated the discovery of numerous latent characteristics inside these models, potentially numbering in the thousands [37]. One prevalent utilization of Deep Learning (DL) in the field of healthcare involves the identification and classification of possibly malignant tumors within radiological pictures [5, 38]. The utilization of deep learning in radiomics, which involves the identification of diagnostically significant characteristics in imaging data that surpass human visual perception, is experiencing a growing trend [39]. Radiomics and DL are frequently observed in image analysis with a focus on cancer [40]. The amalgamation of these technologies exhibits potential for enhanced diagnostic precision compared to the preceding iteration of automated image analysis tools, commonly referred to as computer-aided detection (CAD) [41].

Deep learning is becoming more and more prevalent in the field of speech recognition, therefore making it a subset of NLP, which will be further upon in the subsequent discussion [42]. In contrast to previous iterations of statistical analysis, it is common for individual features inside a deep learning model to possess limited interpretability for human observers [30, 43]. Consequently, the explication of the model's results may prove to be exceedingly challenging or even unfeasible to decipher [44].

4 Impact of Natural Language Processing in Health Care

The pursuit of comprehending human speech has been a longstanding objective among academics in the field of artificial intelligence, dating back to the 1950s. The topic of Natural Language Processing (NLP) encompasses various applications, including but not limited to recognizing speech, text analysis, translation, and other objectives pertaining to language [45]. There exist two fundamental methodologies in the field of NLP: statistical NLP and semantic NLP [31]. Statistical NLP relies on the utilization of machine learning techniques, with a specific emphasis on deep learning neural networks. This approach has played a significant role in enhancing the precision of recognition systems in recent times. Acquiring a substantial "corpus" or collection of language is necessary for the learning process [32]. Within the healthcare domain, the primary utilization of NLP revolves around the generation, comprehension, and categorization of clinical records and scholarly publications [46]. NLP systems provide the capability to analyze unstructured clinical notes pertaining to patients, generate reports such as those related to radiological examinations, transcribe patient conversations, and facilitate conversational AI [47].

5 Healthcare applications of AI and machine learning

The growing use of wearable devices and mobile apps for personal health monitoring provides valuable data that, when analyzed by AI systems, can offer significant benefits [34]. Researchers are using data science to study rare genetic disorders and develop new disease prevention methods [33]. Comprehensive data analysis is essential for creating innovative diagnostic tools for personalized medicine [48]. AI algorithms enhance the accuracy and reliability of image analysis across various organ systems, such as the brain and lungs, using techniques like MRI and ultrasound [6]. These algorithms also empower patients by improving autonomy and enabling self-monitoring of health goals, promoting a healthier lifestyle [37]. AI's ability to analyze large data sets is valuable for fields like epidemiology, enabling better understanding of disease patterns and risk factors [35]. Furthermore, AI offers new opportunities for early disease detection by analyzing phenotypic traits, genetic data, and vital signs such as blood pressure and glucose levels [49].

Rather than presenting a binary option, AI systems assess the probability of an event taking place by utilizing a model that represents the complexities of reality [50]. However, even models that have undergone extensive training can only depict reality with a limited degree of accuracy [36]. Consequently, an artificial intelligence algorithm lacks the capability to exercise autonomous judgment [51]. The results indicate that it is imperative for the medical and nursing personnel to undertake the requisite measures [38]. The benefits of AI for individuals in good health, as well as for other populations with medical conditions, are exemplified by the following instances. The differentiations among the categories are indiscernible. It is possible

for a patient to occasionally belong to many categories. For example, a stroke is a sudden-onset medical condition, often arising from underlying chronic symptoms [7, 8]. AI possesses the capability to detect diseases in their early stages, hence mitigating adverse patient outcomes [39]. The application of machine learning has the potential to provide novel insights into health data. The artificial intelligence algorithm identifies and analyzes relationships and patterns within the dataset. The database expands the volume of data accessible for machine learning promptly upon doing so [52]. This has the potential to assist patients in assessing their susceptibility to future ailments and, if deemed required, modifying their health-related activities [53].

6 Health Monitoring and Prognosis

There is a projection that the utilization of artificial intelligence technology will witness an increase in the context of preventative medical examinations. This increase would be aimed at assessing health data and identifying potential risks. This will expedite the process of identifying risk categories for certain diseases, enabling more efficient implementation of targeted testing and screening measures [54]. In this specific case, it is advisable to pursue medical examinations conducted by a physician as the most optimal line of action. AI is particularly beneficial in the early identification of illnesses [44]. Indeed, the identification of rare diseases at their initial stages might pose challenges owing to the subtle nature of the symptoms they manifest. Researchers involved in the EU project I-PROGNOSIS have recently developed a smart phone application with the aim of facilitating the timely detection of Parkinson's disease [9]. As part of this study, data is being collected from both well and unwell study participants. Routine actions, such as smart phone usage, including making calls and snapping images, are stored as data in a Cloud storage system. The behavior is analyzed utilizing machine learning methodologies, and it is strongly recommended that the user consult a medical professional in the presence of any irregularities [43].

Lifestyle alterations for individual patients can be effectively recommended through the utilization of learning systems, hence facilitating patient self-management. The integration of wearables is expected to have a substantial impact on the dynamics of human-technology interaction, hence giving rise to novel considerations and challenges. Wearable devices have the potential to provide ongoing risk assessments, aid in the establishment of goals for a healthy lifestyle, and facilitate the development of training programs. Global models have the potential to be taught by utilizing the local data that is collected from end devices [10]. Subsequently, suggestions can be formulated for implementing measures at various scales, encompassing individual, regional, and global domains [42]. The term "distributed machine learning" refers to the practice of multiple computers collaborating to collectively train artificial intelligence models [55].

7 AI in Chronic Illness Therapy

Individuals diagnosed with a chronic disease often require lifelong medication. Intelligent technology has the potential to assist with medicine administration and dosage estimation, thereby mitigating stress and minimizing the probability of adverse consequences [52]. In the case of an individual with diabetes, modifying their dietary intake, adhering to prescribed medication, or pursuing medical interventions will collectively augment their insulin requirements. Research is now being conducted to explore closed-loop glucose systems, with the objective of creating autonomous systems capable of replacing the functionality of the pancreas [51]. The intelligent system in question utilizes an algorithm that consistently acquires data from a device designed to measure sugar levels [50]. This data is then utilized to operate an insulin pump, allowing for ongoing adjustments to be made in the control of blood sugar levels [55].

Chronic mental health conditions can exhibit enduring characteristics, whereas prolonged physical ailments commonly contribute to the development of psychological disorders, hence compounding the existing stress experienced by the patient and their family [45]. The utilization of artificial intelligence has promise in facilitating the early detection and intervention of psychological disorders [11, 12, 53]. The system has the potential to offer valuable information that may be utilized by the patient, their family members, the nursing personnel, or the physician for the purpose of treatment or, at the at least, to give them with comforting actions. A model utilizing artificial neural networks has been developed by researchers at the Massachusetts Institute of Technology (MIT) with the aim of detecting depressive changes by analyzing alterations in speech patterns [47]. The construction of the model was facilitated by the utilization of data obtained from a total of 142 clinical interviews [46, 54]. This would facilitate the creation of a minimum one mobile application, wherein the user's textual and verbal inputs would be scrutinized for unusual patterns and indications of deviant conduct [13].

8 AI in Medical assist-Surgery

Artificial intelligence (AI) has emerged as a prominent and dynamic force in the realm of surgical procedures, bringing about transformative changes in multiple facets of this discipline [40]. The following are few significant functions and applications of AI within the field of surgery:

Preoperative Planning: AI has the capability to support surgeons in the process of preoperative planning through the analysis of various medical pictures, including computed tomography (CT) scans, magnetic resonance imaging (MRI), and X-rays [41]. The utilization of this technique facilitates the identification of crucial anatomical features, tumors, or irregularities, hence enabling the formulation of more effective surgical strategies [49].

Robotic Surgery: The utilization of AI-powered robotic systems, such as the da Vinci Surgical System, facilitates the execution of minimally invasive surgical procedures by surgeons, hence augmenting the level of precision achieved [48]. These systems employ AI to convert the manual gestures of the surgeon into accurate robotic maneuvers, therefore minimizing invasiveness and enhancing surgical outcomes [14].

Image Analysis: AI possesses the capability to do real-time analysis and interpretation of medical pictures, hence providing valuable assistance to surgeons during various medical procedures [44]. One illustrative instance involves the utilization of AI algorithms to discern blood vessels or tumour margins, so facilitating the surgeon's navigation and enabling well-informed decision-making.

Predictive Analytics: Machine learning models have the capability to forecast surgical results and complications by utilizing patient data, thereby facilitating surgeons in making well-informed decisions and customizing operations to suit the specific needs of individual patients [15].

Assistive Tools: Surgical instruments utilizing artificial intelligence have the capability to offer immediate feedback to surgeons, including functions such as the identification of areas requiring attention and the provision of recommendations for optimal incision placement. These tools have the potential to augment the decision-making process of a surgeon.

Natural Language Processing (NLP): Natural Language Processing (NLP) algorithms have the capability to extract important data from Electronic Health Records (EHRs) and clinical records, thereby aiding surgeons in comprehending a patient's medical background and facilitating informed decision-making [16].

Training and Simulation: AI-powered surgical simulators provide a secure and lifelike setting for medical trainees to rehearse procedures and advance their knowledge. The utilization of simulations has the potential to expedite the learning process for novice surgeons.

Autonomous Surgery: Currently, there is continuing research in the nascent phase about the development of completely autonomous surgical robots capable of doing routine surgeries with minimal human interaction. AI based technologies possess the capacity to mitigate human fallibility and enhance surgical accuracy [17].

Postoperative Monitoring: AI has the ability to contribute to postoperative care by providing continuous patient monitoring, hence enabling the timely detection and notification of healthcare professionals of any complications that may arise. This has the potential to mitigate the occurrence of postoperative complications.

Data Analysis and Research: AI has the capability to analyze extensive volumes of medical data in order to identify patterns, gain valuable insights, and explore potential enhancements in surgical methodologies and patient results. This phenomenon has the potential to drive progress in surgical methodologies and enhance the quality of patient care.

Telemedicine: AI-driven telemedicine platforms have the capability to establish virtual connections between surgeons and patients or fellow medical professionals, thereby facilitating online consultations, additional opinions, and post-treatment care. This technology is particularly beneficial in geographically isolated or medically underserved regions.

Resource Optimization: AI has the potential to enhance the operational efficiency of medical facilities and systems by facilitating the optimization of surgical schedules, effective allocation of resources, and reduction of patient wait times.

The promise of AI in the field of surgery is considerable. However, it is imperative to prioritize patient safety by subjecting these technologies to rigorous testing, implementing appropriate regulations, and seamlessly integrating them into the healthcare system. The pivotal involvement of surgeons in decision-making will persist, while AI assumes the role of a valued aide and instrument to augment their skills and increase patient outcomes.

9 Future Perspective

Artificial intelligence (AI) is poised to exert a substantial influence on forthcoming healthcare alternatives. The capacity that drives the growth of precision medicine is widely recognized as a crucial advancement in the healthcare industry. Machine learning represents a practical application of artificial intelligence. Although the initial endeavors to offer recommendations for diagnosis and therapy have posed considerable difficulties, it is expected that AI will eventually demonstrate competence in this domain as well. Given the rapid advancements in artificial intelligence pertaining to imaging analysis, it is conceivable that a substantial portion of radiology and pathology images could be subjected to computer-based examination in the near future. The utilization of speech and text recognition is anticipated to witness increased adoption in the future across several domains, encompassing communication with patients and transcription of clinical records. One of the primary obstacles encountered by AI in numerous domains within the healthcare sector pertains not to the determination of the technological sophistication required for practical utility, but rather to the assurance of its acceptance within routine clinical practice. It is imperative that AI systems undergo regulatory approval in order to be integrated with Electronic Health Record (EHR) systems. Additionally, these systems should adhere to standardized protocols to ensure consistent functionality across similar products. Furthermore, it is crucial to educate clinicians on the operation and utilization of AI systems. Moreover, the funding for these systems should be provided by either private or public payer organizations. Lastly, continuous improvement of AI systems should be pursued in the field [18]. Only after that point will there be a significant increase in the acceptance and utilization of the aforementioned concept or technology. The aforementioned problems are expected to be surmounted in the

future; nevertheless, their resolution will necessitate a significantly greater investment of time and effort compared to the pace at which technical advancements are anticipated to transpire. Consequently, it is anticipated that the integration of AI into clinical practice would see a certain degree of implementation within the forthcoming five years, and is expected to gain more prevalence in the subsequent decade [19]. Furthermore, there is an increasing realization that AI systems will not substantially supplant medical professionals in the realm of patient care. Instead, they will serve as aids to human clinicians. Over time, it is conceivable that human physicians may increasingly orient themselves towards jobs and employment structures that leverage distinctively human abilities, such as empathy, argumentation, and holistic integration [20–25]. Healthcare professionals who choose not to collaborate with artificial intelligence face the potential consequence of becoming the only ones to experience unemployment in the foreseeable future.

10 Conclusion

Machine learning (ML) possesses the capacity to emerge as a highly valuable instrument in the possession of medical professionals, scientists, and researchers. There appears to be a constant influx of advancements in the field of machine learning on a daily basis. Each emerging advancement in technology brings forth a unique utilization of ML that has promise in addressing practical challenges within the realm of medicine. The medical business is closely monitoring the advancements in machine learning technologies. Medical professionals are currently employing concepts derived from ML to enhance several aspects of healthcare. These applications include but are not limited to saving lives, identifying illnesses and health issues at an early stage, enhancing patient management, promoting patient engagement in the healing process, and other related advancements. Global organizations have the capacity to enhance healthcare delivery through the utilization of AI-driven solutions and ML models. Due to the advent of this technological advancement, pharmaceutical companies and other industries have gained the ability to expedite and enhance the development of medicines for significant medical conditions. Contemporary businesses possess the capacity to enhance the efficiency of their testing and monitoring procedures through the utilization of methodologies such as pattern identification, the order, and virtual clinical investigations. Health habits and socioeconomic circumstances, including income, social networks (SN), and educational attainment, are significant determinants that contribute to an individual's overall health status. Health organizations recognize the necessity of addressing the holistic well-being of individuals, encompassing lifestyle choices and environmental factors, to enhance overall health. ML models are anticipated to serve as the principal instruments for identifying individuals at elevated risk of developing treatable chronic ailments, such as coronary artery disease, Type 2 diabetes, and similar conditions.

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